Ontario

Select Committee on Energy

Report on Darlington Nuclear Generating Station

1st Session, Thirty Third Parliament
34 Elizabeth II

SELECT COMMITTEE ON
ENERGY

Ontario

LEGISLATIVE ASSEMBLY
ASSEMBLÉE LÉGISLATIVE

COMITÉ SPÉCIAL SUR
L'ÉNERGIE

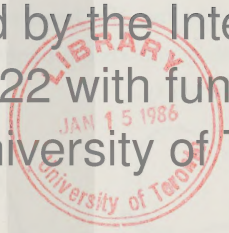
The Honourable Hugh Edighoffer, M.P.P.
Speaker of the Legislative Assembly

Sir,

Your Select Committee on Energy has the honour to present the Report required by its Order of Reference and recommends that it be considered by the House at the earliest opportunity.

Philip W. Andrewes, M.P.P.
Chairman

Queen's Park
December 1985



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EXECUTIVE SUMMARY

The Select Committee on Energy was given a very broad mandate to cover in its ten-month term. It decided to focus its activities, during its fall session, on the Darlington Nuclear Generating Station -- a large project currently under construction on the shore of Lake Ontario. At the time the Committee met, $3.66 billion had already been spent and an additional $3.385 billion had been irrevocably committed, from a total estimated cost of $10.895 billion.

There are a large number of complex issues related to a project the size and magnitude of Darlington. Throughout its hearings on Darlington the Committee reviewed many issues including the impact of Ontario Hydro's borrowing program on the province, safety and environmental protection, electricity demand forecasts, acid gas emission control and the economics of alternative sources of supply.

There was a concern that Ontario Hydro's considerable borrowing program, including borrowing required to complete Darlington, would have a negative impact on the province's credit rating, or restrict the government's opportunities for borrowing for other program areas. The Committee has concluded that Ontario Hydro's financing needs do not represent such a threat.

The Committee has also determined that although the construction of Darlington would help Ontario Hydro meet acid gas emission standards, it is not needed for this purpose alone because viable alternatives exist. Many witnesses also expressed concerns about safety and environmental protection. However, the Committee is not aware of any new information that would significantly change the debates about these issues which have been reviewed by other committees and government agencies.

Significant changes have occurred in the planning environment of Ontario Hydro since Darlington was approved. Load growth forecasts have changed so dramatically that all units of Darlington are not likely to be needed to meet demand until the turn of the century -- 12 years after the first unit of Darlington will be commissioned.

The Committee has also examined the need for Darlington as a means to lowering the cost of generation and has found that the cost advantages of Darlington over coal-fired stations exist within a relatively wide range of financial and demand variables. However, the feasibility of cancellation, although not probable, is within the realm of possibility even with 65% of the project's costs irrevocably committed.

This finding highlights a serious concern that the Committee has about Ontario Hydro's planning process and about the delineation of operating and policy-making responsibilities between Ontario Hydro and the Government. The Committee does not feel that existing practice allows for adequate public participation in the determination of policy variables in Ontario Hydro's planning process. Faced with significant surplus capacity, a surplus that will last for many years if Darlington comes on stream, Ontario Hydro has had little incentive to promote efficiency and conservation or to give adequate consideration to alternative sources of supply of electrical energy.

A wide range of alternatives is possible for Ontario's electricity and energy future. The direction Ontario takes within this range can be largely determined by policy choices. If Darlington's cancellation is even feasible at this late stage, what alternatives could we be facing if different policy choices had been considered or implemented at an earlier stage in Darlington? Will the situation of overcapacity, which is expected to persist until the late 1990's, continue to bias Ontario's Hydro's planning process? These concerns have led the Committee to the following recommendation:

RECOMMENDATION 1: **Without limiting the broad scope of the Committee as set out in its terms of reference, the Committee should give priority to an examination of the relationship between the Government of Ontario and Ontario Hydro for the purposes of clarifying the relationship, setting out the specific responsibilities of each and defining the mechanisms that can activate the responsibilities.**

Ontario Hydro is at an important stage in its planning process because there are no commitments for major capacity additions plans beyond Darlington. For the first time in over a decade, Ontario Hydro is undertaking a fundamental review of demand and supply options. This is a critical study because it involves policy choices that will affect the shape of Ontario's electricity future. Ontario Hydro has already narrowed the range of options it is considering. This study represents an excellent opportunity for much needed policy input into the planning process.

RECOMMENDATION 2: **The Committee should undertake an independent review of the Ontario Hydro demand/supply options study backed by such expertise as may be required to illuminate specific and critical issues embodied in it.**

The Committee wishes to provide time for its review of Ontario Hydro's demand/supply options study, for the review of Hydro's planning process and for the Government to implement recommendations arising from these studies before a large portion of the remaining discretionary funds for Darlington are irrevocably committed and the options of government are unduly restricted. Since the construction of Units 1 & 2 is substantially complete, with approximately 80% of the costs committed, it is recognized that cancellation of these units could not be economically justified. On the other hand, Units 3 & 4 are not scheduled to come on stream until 1991 and 1992 so timing is less critical. It would appear that approximately 85% of the total Darlington costs would be expended if units 3 & 4 were cancelled at this time; in other words 85% of the expenditures for a 50% asset. This does sot appear to be a wise choice. However, to keep the options open in this regard the committee makes the following recommendation concerning Darlington:

RECOMMENDATION 3: **No further significant contracts for units 3 & 4 should be let for materials not required for construction during the next 6 months while the committee studies demand and supply options.**

I. INTRODUCTION

On July 10, 1985, the Select Committee on Energy under the chairmanship of Mr. Philip Andrewes (Lincoln) was appointed by the Legislative Assembly of the Province of Ontario to "inquire into and report within ten months on Ontario Hydro Affairs". The Committee planned two sessions of hearings for periods when the Legislative Assembly was not sitting - one session in the early fall of 1985, the second in the winter and early spring of 1986. In its first session the committee decided to review the Darlington Nuclear Generating Station. Darlington is a very large, 4 unit nuclear-powered electricity generating station currently under construction on the shore of Lake Ontario in the town of Newcastle. At the time the Committee met, construction had been underway for over four years years. The first two units are scheduled to become operational in 1988 and 1989 with the second two scheduled to become operational in 1991 and 1992.

Over the past decade, the nuclear industry has been a major area of investment in Ontario. Since 1977, the year that approval for construction was given for Darlington, $10.5 billion has been spent by Ontario Hydro on all of its nuclear generation and heavy water production facilities (about $3.6 billion was spent on Darlington). This compares to a total investment by other sectors of $9.1 billion in agriculture and fishing, $6.7 billion in primary metal and steelmaking, $6.1 billion in automobile manufacturing, and $4.3 billion in mining over the same time period.[1]

While construction programs continued on large, capital-intensive, centralized nuclear generating stations in Ontario, a number of events were occurring to create tremendous uncertainty in the planning environment of the electricity supply industry in North America. The uncertainty made planning a very difficult task for utilities, at a time when the costs of an error were vastly increasing. Growth in demand broke from its historical patterns and utilities throughout the industrialized world, were forced to reduce their load growth projections significantly. Declining demand growth, rapidly escalating costs and an increasingly restrictive regulatory environment wreaked havoc on the U.S. nuclear industry causing dozens of project cancellations and costing tens of billions of dollars. At the commencement of this study, no new orders for nuclear generating stations were on the books anywhere in North America.

Ontario Hydro has not been insulated from these problems. Their load growth forecasts have been consistently reduced. The nuclear program was subject to scrutiny by a Select Committee and a Royal Commission and their

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1. Statistics Canada, Bulletin 61-296

heavy water project was the victim of significant cost overruns. Darlington is the last of five major nuclear generating stations (following Pickering A, Bruce A, Pickering B and Bruce B) and is the last major construction project to which Ontario Hydro is committed.

The Committee's agenda spanned seven weeks (Appendix A) in which 148 witnesses appeared (Appendix B) and 148 exhibits were filed (Appendix C). Determining the relevant criteria for evaluating the merits of continuing with Darlington is a difficult task. There are a tremendous number of complex issues related to a project of this type and magnitude.

One of the issues reviewed was Ontario Hydro's considerable borrowing program. Ontario hydro has a total debt of over $20 billion and borrows about $2 billion each year. In Canada, the Government of Ontario guarantees Ontario Hydro's debt. In the U.S., the Government borrows on behalf of Ontario Hydro. During the initial stages of the Committee's hearings, there was concern about the possibility that the province's credit rating, which was under close scrutiny at the time, would be negatively affected by Ontario Hydro's borrowing program. In addition, critics of Ontario Hydro claim that its large borrowing levels limit the government's options for spending in other areas.

The Committee reviewed the funding arrangements of Ontario Hydro and investigated the impact that Ontario Hydro's plans, including the financing of Darlington, have on the province's financial situation. Two major conclusions emerged. First Ontario Hydro does not at this time affect the province's credit rating. As long as Ontario Hydro generates sufficient revenue to meet its interest obligations, it is considered a self-supporting entity. As a self-supporting entity it has no negative impact on the credit rating. Secondly, Ontario Hydro's borrowing program does not restrict spending on other government programs. The combined borrowing of the province and Ontario Hydro does not approach the province's debt capacity and Ontario Hydro's debt, as a percentage of the province's debt, is not projected to increase. A more detailed summary of these findings is contained in Appendix D.

Safety and environmental protection are issues that were referred to repeatedly by witnesses appearing before the Committee. Of particular concern is the long-term storage of spent fuel rods. The Committee recognizes the extreme importance of these issues to our society, but many of them have been reviewed in detail by previous committees and government agencies prior to the commitment of significant resources to Darlington. The Committee is unaware of any new information that would significantly change the debates about these issues.

Therefore, the unique contribution the Committee can make is not to debate the nuclear option in general, but rather to make a current assessment of the viability of completing this large capital project to which a significant amount of public funds has been already committed. This report, therefore, focusses primarily on the need for Darlington and public policy issues involved in planning and completing it. It is in two major sections. The first section, contained in Chapter II, addresses the question of need and concludes that Darlington is justifiable primarily as a cost minimization strategy. It is demonstrated that Darlington is not needed to meet demand until after 1997/98 and it is not needed to meet acid gas emission standards.

The Committee's review of Darlington highlights a number of concerns about Ontario Hydro's planning process and its relationship with government. These issues are dealt with in the second section of the report found in Chapter III. This chapter concludes that there are significant issues to be addressed in the relationship between Ontario Hydro and the Government. Further, a study of demand/supply options that is currently underway provides an excellent opportunity for the Committee to influence Ontario Hydro's long-term planning.

Finally, Chapter IV of the report pulls together the implicatons of the Committee's findings on Darlington and its recomemndations on policy control of Ontario Hydro into a specific recommendation on the Darlington construction project itself.

II. THE NEED FOR DARLINGTON

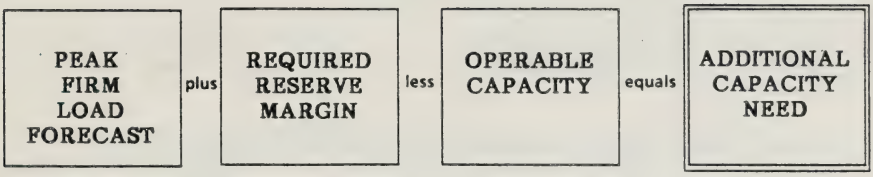
When Darlington was planned by Ontario Hydro some ten years ago, it was justified primarily as an efficient way to meet the growing demand for electricity - a demand which had been growing at about 7% per year for decades. In fact, in 1977, Ontario Hydro was given approval to proceed with the station without a formal environmental hearing because of the perceived urgency of meeting these needs in the mid-1980s. Since that time, the station's construction was slowed down as the load forecast changed indicating a diminishing growth in the demand for electricity. Later, Darlington was accelerated as part of a government strategy to stimulate the economy. A key question facing this Committee was to determine whether the station was still needed. Although $7.1 billion has been committed to the project, there is $3.76 billion that could be saved if the plant is not built.

The Committee examined the need for the plant from three perspectives - whether the electric system needs the additional generating capacity; whether the plant is needed to reduce Ontario's acid gas emissions; and whether the plant is needed to minimize the overall cost of electricity to the province's consumers in the 1990s and into the next century.

The Committee's findings in these three areas are addressed in the sections following which conclude that all units of Darlington are not needed to meet demand until the turn of the century - 12 years after the first unit is scheduled to begin production. As well, Darlington is not needed to meet environmental standards. Although it will cause acid gas emitting stations to be taken out of production, it cannot be justified for this reason alone. Finally, Darlington may be the least cost alternative for meeting future electrical energy needs. The additional cost of completing the plant will probably be justified by the impact it may have on minimizing costs. It is possible however to envisage a future where the cost minimization strategy does not work.

DARLINGTON CAPACITY NOT NEEDED BEFORE 2000

As might be expected, the planning systems Ontario Hydro employs to determine whether to commit billions of dollars to build a plant that will not be ready for a decade and that will be producing power for generations to come are very complex. Despite their complexity, the need for additional capacity can be reduced to a simple equation:



In this section of the report we will examine each factor in the equation. First, we will conclude that the demand for electricity could be less than Ontario Hydro has forecast. Secondly, we will accept - for the purposes of this report - the margin that Ontario Hydro sets aside for a reserve margin. Thirdly, we will show that operable capacity could be sufficient to meet demand past the turn of the century.

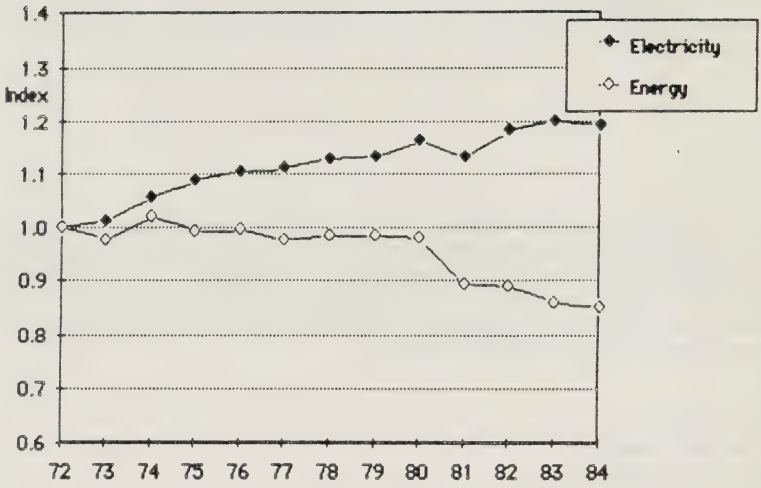
Demand Could Be Below Ontario Hydro's Forecast

Ontario Hydro's plans for a forecasted level of demand which depends on assumptions about a wide range of critical variables including economic growth, energy prices, improvements in efficiency, conservation efforts and developments in electrotechnologies. Some witnesses claimed that Ontario Hydro has not been promoting efficiency or conservation and it is possible that sufficient gains can be made in these areas to eliminate the need for Darlington completely. Others argued that gains in efficiency and conservation have already been made and incorporated into current load forecasts and, further, that there are a number of factors which inhibit the pace and extent of future gains in efficiency and conservation.

The Committee has reviewed aggregate levels of electricity consumption to determine what trends have been occurring in Ontario, to compare them to trends in other jurisdictions and outline a range of plausible futures for demand in Ontario.

EXHIBIT 1

ONTARIO'S ECONOMY HAS BECOME MORE ELECTRICITY INTENSIVE EVEN AS ITS OVERALL ENERGY INTENSIVENESS HAS DECREASED



Energy and electricity consumption measured in BTUs
Gross Domestic Product in constant dollars

Two key ratios have been used to do this analysis - energy intensity and electricity intensity. They are derived as follows:

$$\text{Energy Intensity} = \frac{\text{Aggregate Energy Consumption}}{\text{Gross Domestic Product (GDP)}}$$

$$\text{Electricity Intensity} = \frac{\text{Aggregate Electricity Consumption}}{\text{Gross Domestic Product (GDP)}}$$

The absolute intensity of energy and electicity consumption, of course, varies widely among different jurisdictions because of important differences in the cost of energy and electricity, the composition of industrial sectors (some are more electricity-intensive than others) and geography (implications for heating and transportation). In 1982, for instance, Canada used 1,599 watt-hours per GDP dollar compared to 1,105 for the United States, 884 for the U.K., 749 for Japan, and 647 for Germany [2].

Nevertheless, it is useful to compare the direction and rate of change in these ratios. An index was developed for Ontario's ratio by using its 1972 ratio as a base year and it was graphed to reveal which direction energy and electricity intensity is moving in Ontario. Regression analysis was then performed to determine a trend line for the intensity ratio and to determine the average annual rate of change in the ratio.

The period of review is post-1972, after OPEC began to control world oil prices. Prior to 1972, the relationship between electricity consumption and gross domestic product was relatively stable. In fact for about 50 years the rate of growth in electricity consumption in Ontario had rarely deviated by more than a few tenths of a percentage point from 7% per annum.

Exhibit 1, opposite, shows the results of this analysis for Ontario. Two trends are evident: while energy consumption per dollar of GDP was stable through the seventies and began to fall in the eighties, electricity consumption per dollar of GDP was generally increasing until very recently. This means that although efficiency and conservation measures have reduced energy intensity, electricity has become a more popular form of energy.

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2. International Energy Agency; Electricity in IEA Countries: Issues and Outlook, OECD/IEA, Paris, France, 1985, p. 189

Exhibit 2, below, compares the annual rates of change of Ontario and Quebec with other jurisdictions and demonstrates significant potential for improvement for Ontario in its electricity intensity. Each year Ontario has been using an average of 1.5% more electricity to produce the same amount of GPP, while Japan, for instance, has been using 0.49% less each year. The point to be noted here is not that Ontario should reverse the direction of its electricity intensity, but that experience in other jurisdictions shows that gains can be made if they are desirable. Another perspective is that the jurisdictions that increased their electricity intensity did so as a conscious policy decision to become less dependent on imported energy sources.

EXHIBIT 2

COMPARING ANNUAL RATES OF CHANGE IN ELECTRICITY INTENSITY* (1970-1983)

Australia	3.81%
Sweden	2.58%
Quebec **	2.40%
France	2.07%
Ontario **	1.50%
Canada	1.30%
Germany	1.26%
U.S.	0.33%
Japan	-0.49%
Norway	-0.73%
U.K.	-0.83%

* Source: International Energy Agency

** 1972-1983

An analysis of similar ratios in the U.S. substantiates the claim that Ontario has not been controlling its electricity use relative to GDP (or personal income in the case of the Exhibit 3, below) to the degree achieved by other jurisdictions.

California appears to be the leader in its reduction of electricity intensity. These results substantiate the claims of several expert witnesses that California has been innovative in implementing efficiency and conservation programs. According to our analysis, California has been able to reduce its electricity intensity by an average of 1.59% per year, over the 12-year period 1972-1983, compared to an increase of .19% for Ontario. This rate means that California would be using 19% less electricity per real dollar of personal income earned in 1983 than it would in 1972.

EXHIBIT 3

COMPARING ANNUAL RATES OF CHANGE IN ENERGY AND ELECTRICITY INTENSITY (1972-1983)

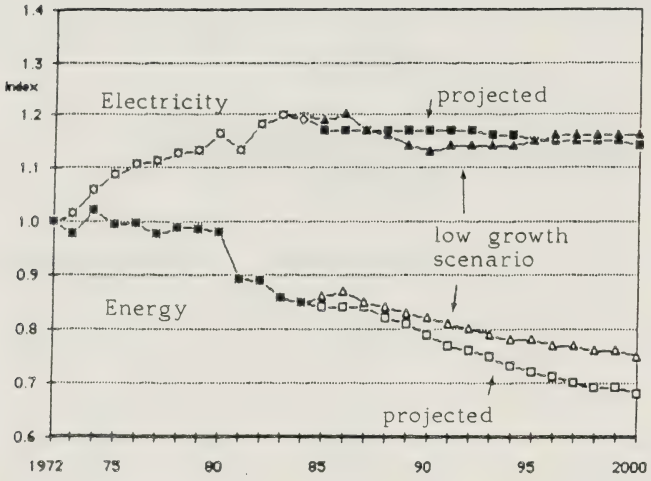
	Energy/Income (%)	Electricity/Income (%)
Ontario	-1.65	+0.19
U.S.	-2.38	+0.02
California	-2.79	-1.59
Massachusetts	-3.92	-0.07
New York	-2.83	+0.35
Texas	-3.42	-0.69
Washington	-2.39	-0.94

Source: background data from Energy Information Administration, Washington, D.C.

In absolute terms, the real gains achieved over this 12-year period do not appear to match the optimistic claims of several expert witnesses. Although electricity use relative to personal income declined, total personal income rose even faster increasing total electricity use. In fact, in absolute terms, actual consumption of electricity increased 22% in California over this period. Even so, gains equal to California's experience would have a significant effect on load growth forecasts of Ontario Hydro.

EXHIBIT 4

ONTARIO HYDRO PROJECTIONS FOR THE INDICES OF ENERGY AND ELECTRICITY INTENSITY



Observations:

1. Electricity -GPP ratio projected to remain constant
2. Energy intensity continues to decline
3. Low growth scenario possible only if GPP declines

As exhibit 4, opposite, demonstrates, Ontario Hydro projects electricity intensity to remain constant, in both the "most probable" and "low-growth" scenarios, while energy intensity is projected to decline. In Ontario Hydro's scenarios, low load growth is possible only if there is low economic growth. However, evidence shown earlier indicates that several jurisdictions have been able to sustain a level of real economic growth with less electricity. The chart in Exhibit 5 shows the effect that different degrees of improvement in electricity intensity would have on the load forecast. This effect is shown graphically in Exhibit 6.

First of all, at no change in the electricity intensity the resulting load growth is 2.8% per year (using Ontario Hydro's projections of GPP). Since Ontario Hydro forecasts a load growth of 2.6%, it is apparent that they expect electricity intensity to decline slightly (in fact, -0.2% per year). Therefore, the debate is not about the direction of change in electricity intensity, but rather the magnitude of this change.

Exhibit 5 also demonstrates that if electricity intensity declined at a rate of 1.5% per year, roughly the equivalent of gains made in California from 1972 to 1983, the load growth would be 1.2%. If we are to assume that Ontario was able to achieve modest improvements in its electricity intensity, say -0.8%, one-half of the rate of improvements achieved by California since 1972, then Ontario's electricity demand would grow at an annual rate of only 2.0%.

If GPP growth were to be lower, as in Ontario Hydro's lower growth scenario, then modest improvements in electricity intensity (-0.8%) would almost eliminate growth in electricity demand, reducing it to an average annual growth rate of .2%.

EXHIBIT 6

EFFECT OF DECLINING ELECTRICITY INTENSITY

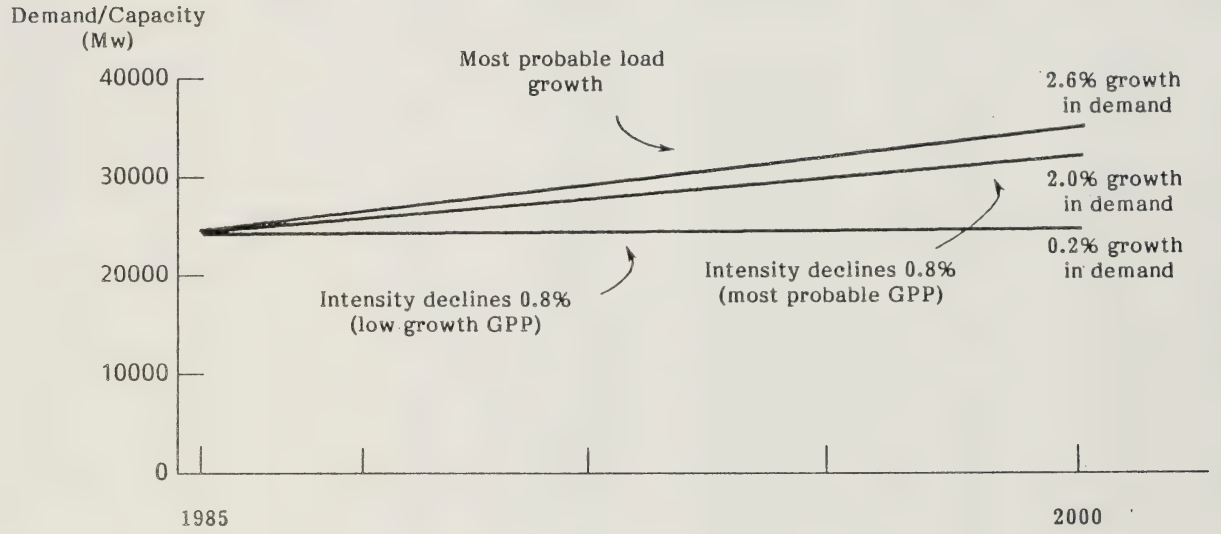


EXHIBIT 5

ESTIMATING THE IMPACT OF
LOWER ELECTRICITY INTENSITY

Annual % Change in Electricity-GPP Ratio (Slope)	Resulting Growth Rate in Electricity Demand in Ontario to 2000 *Most Probable*	Resulting Growth Rate in Electricity Demand in Ontario to 2000 *Low Growth*
0.0	2.8	1.0
-0.4	2.4	0.6
-0.8	2.0	0.2
-1.6	1.2	-0.6

Source: Committee Analysis

Several important conclusions can be drawn from the analysis of electricity intensity. First of all, the once stable relationships between electricity and GDP has changed and the growth in electricity intensity is slowing down. Some jurisdicitons show a declining intensity, the result of the implementation of conservation and efficiency programs. Other jurisdictions have an increasing electricity intensity, the result of deliberate policy choices. It is apparent that the growth of electricity intensity is largely a function of policy choices and that modest improvements in intensity would result in expected levels of economic growth being supported by growth levels in demand of only 2.0%.

Despite Current Surpluses Ontario Hydro's Planned Reserve Requirement Is Acceptable

Many people are concerned that Ontario Hydro appears to have 41% (7983 MW) more capacity than it needs to meet peak electricity demands. The concern is intensified by the very high cost of building additional generating capacity. As Exhibit 7 shows, Ontario Hydro shares a problem common to many Canadian utilities who have been caught with more generating capacity than they needed when demand growth failed to meet expectations. Ontario Hydro though, like utilities in Alberta, reports a requirement for a relatively high reserve margin of 25%. If it actually needs such a high reserve margin, its "surplus margin", at 16% (3153 MW) is among the lowest in the country.

EXHIBIT 7

CAPACITY SURPLUSES IN CANADIAN PROVINCES

% of Peak Demand

	Capacity Margin	Required Reserve Margin	Net Surplus
New Brunswick	57	20	37
Nova Scotia	55	20	35
British Columbia	47	15	32
Ontario	41	25	16
Newfoundland	39	12	27
Alberta	38	22	16
Manitoba	37	15	22
Quebec	28	10	18

Source: Energy, Mines and Resources

EXHIBIT 9

REQUIRED RESERVE MARGIN

	Required Reserve Margin
Ontario	25
Alberta	22
New Brunswick	20
Nova Scotia	20
Prince Edward Island	20
British Columbia	15
Manitoba	15
Saskatchewan	15
Newfoundland	12
Quebec	10

Source: Energy Mines and Resources

Exhibit 8 compares capacity margins in Ontario to those found in the U.S.A. using a slightly different, U.S. measure. Again it shows that Ontario's capacity margin is comparable to the average of United States utilities. However, since Ontario Hydro's actual unavailability in 1983/84 was worse than the average U.S. utility, its operating margin (another way to get at the "surplus" question) is actually significantly less than the average.

EXHIBIT 8

CAPACITY MARGINS ONTARIO AND THE UNITED STATES

	% of Total Capacity		
	Capacity Margin	Unavailability (1983/84)	Operating Margin
Ontario	25.4	18.7	6.7
United States*	25	15	10
Range for 9 U.S. Regions*	15 to 31	9 to 30	-4 to 17

* Source: EPRI

Ontario's capacity surplus is often a point of contention with the public, but the important variable is the required reserve margin used in capacity planning. Referring to the equation shown at the beginning of this Chapter, it is the level of reserve margin that adds to the level of additional capacity required. Reserve margin is required to handle scheduled maintenance, breakdowns, operating constraints, transmission considerations and other problems that may interrupt the supply of electricity. Therefore, the size of the reserve margin is determined partly by the generation mix and partly by a policy choice (between cost and the likelihood of a shortage). Large, centralized generating stations such as Darlington tend to increase the reserve requirement. As Exhibit 9 (opposite) shows Ontario's reserve margin is the highest among Canadian provinces. Although the reserve margin is large for Ontario, the Committee has not been presented with any evidence suggesting it could be lower, and for now, it accepts Ontario Hydro's planned margin.

Capacity Available to Meet Demand To 2000

This section compares the range of possible load growths outlined earlier in this chapter to Ontario Hydro's potential generation capacity (with and without Darlington). Exhibit 10, below, shows that by 1992, Ontario Hydro will have capacity of 30,469 MW, without Darlington, although this includes mothballed capacity and capacity that will cost a considerable amount to operate.

EXHIBIT 10

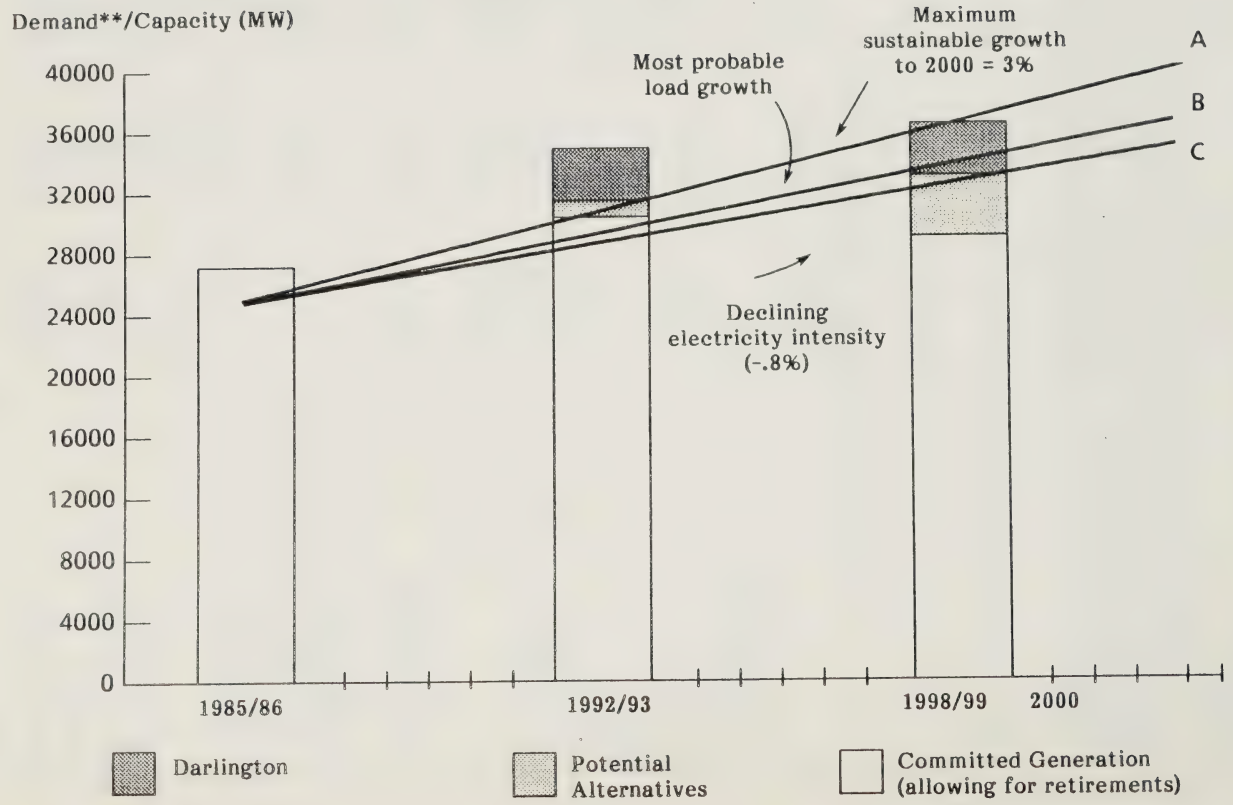
POTENTIAL GENERATION CAPACITY (MW)

	1985/86	1992/93	1998/99
Existing Committed (excl. Darlington)			
Hydraulic	6,500	6,500	6,500
Nuclear	7,401	10,562	10,562
Fossil			
. coal	10,169	10,169	9,322
. natural gas	588	588	0
. oil (stem)	2,232	2,232	2,232
. oil (CTUs)	418	418	418
	13,407	13,407	11,972
Total Committed (excl. Darlington)	27,308	30,469	29,034
Potential Additional Sources (OH estimates)			
. purchases		1,000	3,000
. large hydraulic			670
. small hydraulic			20
. cogeneration		100	340
. MSW		20	50
		1,120	4,080
Total Potential (excl. Darlington)	27,038	31,859	33,114
Darlington	-	3,524	3,524
Total Potential	27,308	35,113	36,638

Source: Ontario Hydro

EXHIBIT 11

DEMAND AND CAPACITY*



* Supporting figures are presented in Exhibit 10.

** Demand lines include reserve requirement.

If we add to the 30,469 MW of planned capacity Ontario Hydro's estimates for potential alternative sources, the capacity figure becomes 31,859 MW. Darlington would add an additonal 3,524 MW to the system bringing the total potential capacity to 35,113 MW in 1992/93. The figures for 1998/99 allow for the retirement of Keith and Hearn, plants that Ontario Hydro believes could be rehabilitated if needed, given expected developments in technology. Purchases represent potential agreements with the provinces of Manitoba and Quebec, who are planning for surpluses in their systems. The figures used for hydraulic, cogeneration and municipal solid waste (MSW) are Ontario Hydro's estimates, estimates which many witnesses believe are very conservative.

The graph in Exhibit 11 puts these capacity figures together with the range of possible load growths outlined earlier in this chapter. This exhibit clearly indicates that even if we allow for retirements and use conservative estimates for alternative sources, Ontario Hydro will have enough capacity without Darlington to meet the most probable load growth (Line B) until 1997/1998. With Darlington in the system, Ontario Hydro will have sufficient capacity to meet a demand growth of 3% per annum (Line A). If policy options are chosen that result in a modest decline of -0.8 in electricity intensity and a load growth of 2.0% there is no need for Darlington (Line c). In fact, with such an improvement in electricity intensity, Darlington is not needed until 2001. If Keith and Hearn were rehabilitated, Ontario would have additional flexibility without Darlington, and could meet a demand growth of 2.0% until 2003.

DARLINGTON NOT JUSTIFIED FOR ACID GAS REDUCTION ALONE

The Ministry of the Environment is in the final stages of developing an acid gas control plan which will make up Ontario's component of a federal-provincial control plan. Currently, Ontario Hydro is required to limit its acid gas emissions to 450,000 tonnes per year from 1986 to 1989 and to 300,000 tonnes per year from 1990 onward. The new acid gas control plan may reduce the allowable emissions even further

Darlington will help Ontario Hydro meet these standards, but this is not reason enough to justify building it. Originally, Darlington was planned to meet demand growth. As the expected demand growth declined, it has become apparent that Darlington will create a surplus in the early 1990s and allow Ontario Hydro to replace coal-fired stations, a major contribution to the acid gas problem. If Darlington was cancelled, Ontario Hydro would have to find another solution. At the current time, the alternative to replacing coal-fired stations with nuclear stations is to put scrubbers on the coal-fired stations. The cost of scrubbers depends on the level of demand, which would determine how much coal-fired capacity is required, and developments in technology (better and cheaper alternatives to current technology are expected). Costs of sulphur dioxide scrubbers have been estimated[3] and included in our analysis of alternatives, however these are Ontario Hydro's estimates and the Committee has not challenged them. If meeting acid gas emission standards was Ontario Hydro's only consideration, it is clear that scrubbers are a significantly cheaper alternative than building Darlington.

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3. Ontario Hydro has estimated the capital cost for SO_2 scrubber facilities at $250 million (in 1985 dollars) for a 2 x 500 MW coal-fired generation facility. The operating and maintenance costs could be up to $15 million per year. Additional capital and operating costs would be required to control NO_x emissions.

DARLINGTON JUSTIFIED PRIMARILY FOR COST MINIMIZATION

The report has shown that Darlington is not needed to meet demand, and it is not needed for meeting acid gas emission standards. If Darlington is to be justified, then it must be on the basis that it would reduce the future cost of generation.

Evaluating the economics of Darlington is a complicated task to which there is not a simple yes or no answer. If things go as planned, construction of Darlington will be completed in 1992 and Darlington will remain in service for up to 40 years. The range of possible futures for the electricity industry over such a time span is tremendous. The future depends on a wide variety of inter-related variables. Ontario Hydro has made assumptions about these variables and included them in simulation models to compare the cost of Darlington with the coal option under several different economic scenarios. Exhibit 12, below, contains the key assumptions Ontario Hydro has used in its cost analysis of Darlington. Exhibit 13, over, contains Ontario Hydro's estimates of Darlington's project costs.

EXHIBIT 12

KEY ONTARIO HYDRO ASSUMPTIONS IN COST ANALYSIS OF DARLINGTON

		Economic Scenario		
		Lower	Forecast	Upper
Load Growth ('85-'00)		1.1	2.6	4.0
GPP ('85-'00)	- nominal	4.75	9.4	9.5
	- real	1.25	2.9	4.5
Inflation ('85-'95)3.5		6.5	5.0	
Prime Interest Rate ('85-'95)		7.5	11.3	9.5
Exchange Rate (value of Cdn.$ in U.S.$)				
	- 1990	.75	.75	.80
	- 1995	.74	.74	.86
Crude Oil	- '85-'90	-4.0	0.3	1.5
	- '91-'95	-0.5	1.0	2.0
Natural Gas	- '85-'90	0.5	0.5	3.0
	- '91-'95	2.0	2.3	3.5

Note: All figures shown represent the average annual percentage change, except the exchange rate which is the value of the Canadian dollar as expressed in U.S. dollars

EXHIBIT 13

DARLINGTON PROJECT COST ESTIMATE

($ millions, current $)

	$ Spent	Unavoidable Commitments	Total Committed	INCREMENTAL COSTS FOR EACH ALTERNATIVE: Cancel All	Complete 1, 2	Complete All
Design and Construction:						
- engineering	400	30	430	10	140	180
- permanent materials:						
. 0,1,2,	980	180	1,160	0	90	180
. 3,4	130	320	450	0	0	350
- total construction	1,110	500	1,610	0	90	530
	560	40	600	80	460	910
Total Design & Construction	2,070	570	2,640	90	690	1,620
Operations:						
- commissioning	20	0	20	0	150	170
- training	35	0	35	0	85	155
- heavy water	880	0	880	0	350	870
- fuel	0	0	0	0	30	70
Total Operations	935	0	935	0	615	1,265
Interest Charges	655	2,815	3,325	0	500	965
Total	3,660	3,385	7,045	90	1,805	3,850
Total Committed				7,045	7,045	7,045
Total Per Alternative				7,135	8,850	10,895

Notes:
1. Unit "0" refers to common services and facilities
2. "$ Spent" represents monies paid out to date
3. "Unavoidable Commitments" refers to monies which will have to be paid out to cover interest charges and to honour existing contract commitments, less $400 million in estimated savings (from contract costs avoided through negotiation and the salvage value of permanent materials)

These variables are important determinants of the relative cost of alternatives. They are all inter-related and assumptions made about them create a framework within which a range of plausible cash flows for each alternative are determined. Because of the complexity and detail involved, the Committee has not been able to reconstruct the models in the time frame required. Nevertheless, working within Hydro's overall economic framework the Commitee has been able to construct a simple model to explore the impact on each alternative of changes in less dependent, financial variables.

In order to compare the costs of each alternative and to assess the real impact of changes in variables, a Net Present Value analysis has been performed on the streams of cash flow from 1985 to 2030, the expected life of Darlington. Exhibit 14, below, presents the results of Ontario Hydro's analysis of alternatives. It shows that under the most probable, growth scenario, completing Darlington is its most favourable alternative. Cancelling Darlington would cost the province $5.232 billion extra if the most probable growth occurred, and $2.315 billion if low growth occurred. Under the low growth scenario, completing only Units 1 and 2 would cost Ontario Hydro $978 million more than the alternative of completing all units. The detailed costs behind the chart in Exhibit 14 are shown in Appendix E, Schedule 1 and Schedule 2.

EXHIBIT 14

ONTARIO HYDRO'S ANALYSIS OF ALTERNATIVES

Net Present Value Loss Relative to Building Darlington (expressed in $ millions)

	Most Probable Scenario	Low Growth Scenario
Complete All Units	0	0
Complete Units #1 and #2	2,705	978
Cancel All Units	5,232	2,315

EXHIBIT 15

COMPARATIVE ESTIMATES OF KEY ASSUMPTIONS IN DARLINGTON COST ANALYSIS

	ONTARIO HYDRO	OTHER ESTIMATES [1] (average annual percentage change)			
	Base Case	MOE[1]	DRI[2]	NEB[3]	ENERDATA[4]
Load growth (1985-2000)	2.6	2.2	n/a	n/a	n/a
GPP growth ('85-'95)					
- nominal	9.5	8.5	n/a	8.3	8.8
- real	3.0	2.5	n/a	3.3	3.2
Inflation ('85-'95)	6.5	6.0	5.5	5.0	5.6
Interest Rate (prime commercial rate)	11.6	10.3	10.9	9.6	10.0
Crude Oil (real terms)					
- '85-'90	.5	-1.1	-6.3	0.9	1.0
- '91-'95	1.0	0.3	0.4	2.1	8.1
Natural Gas (real terms)					
- '85-'90	.5	-1.1	-.3	0.9	1.0
- '91-'95	2.3	2.1	5.6	1.8	8.1
Exchange Rate (value of Cdn.$ in U.S.$)					
- 1990	.75	.78			
- 1995	.74	n/a			
- 2000	.68	.80			

1. Ontario Ministry of Energy, Economics and Forecast Branch
2. Data Resources Institute, May 1985
3. National Energy Board, Canadian Energy Supply and Demand 1983-2005, Technical Report, Sept., 1984
4. Canadian Enerdata Ltd., Canadian Energy Trends, May, 1985

Exhibit 15, opposite, shows that several of Hydro's assumptions differ from estimates of other reputable groups. Therefore, the Committee has altered the following variables independently to determine the importance of each variable in the decision to minimize costs:

1. Project costs
2. Discount rate
3. Decommissioning costs
4. Export sales
5. Coal prices.

Our analysis shows that the cost advantage of continuing with Darlington depends most on load growth, discount rate and coal prices. However, **no variable can be altered within a plausible range and, by itself, change the optimal solution** (Appendix F and Appendix G contain sensitivity analysis for the low-growth scenario).

In an attempt to determine the boundaries of Darlington's feasibility, the Committee changed several variables simultaneously, to create two alternative scenarios shown in Exhibit 16, below. Alternative Scenario #1 has been constructured by changing the five variables within a reasonable range. For example, since performing this analysis, the province's credit rating has been downgraded, an event that will increse Ontario Hydro's borrowing cost and could increase the discount rate by .5%. Alternative Scenario #2 is comprised of assumptions that, individually, are possible but are unlikely to occur altogether. Nevertheless, this scenario has served a valuable purpose in helping to outline what the Committee feels is a range of plausible futures.

EXHIBIT 16

ALTERNATIVE SCENARIOS

	Ontario Hydro		Select Committee	
Variable	Low Growth	Forecasted Growth	Alternative Scenario #1 (Moderate)	Alternative Scenario #2 (Extreme)
Average annual real discount rates	3.69	4.27	Hydro est. + 1%	Hydro est. + 2%
Export Sales	$970m	$520m	50% of hydro est.	0
Coal Prices*	depends on types of coal	depends on types of coal	10% less than Hydro est.	20% less than Hydro est.
Project Costs Remaining	as budgeted	as budgeted	10% over budget	20% over budget
Decommissioning Costs	4% of project costs	4% of project costs	10% of project costs	30% of project costs

* Ontario Hydro has submitted detaild forecasts of prices for different types of coal and under different scenarios. Foreçasted prices for the most probable scenario appear in Appendix H

EXHIBIT 17

SENSITIVITY ANALYSIS - MOST PROBABLE LOAD GROWTH

NPV loss relative to most favourable option (expressed in $ millions)

	Hydro Base Case	Alternative Scenario #1	Alternative Scenario #2
Complete All Units	0	0	0
Complete Units #1 & 2	2,705	1,423	820
Cancel All Units	5,232	2,638	1,303

EXHIBIT 18

SENSITIVITY ANALYSIS - LOW GROWTH

NPV loss relative to most favourable option (expressed in $ millions)

	Hydro Base Case	Alternative Scenario #1	Alternative Scenario #2
Complete All Units	0	36	1,148
Complete Units #1 & 2	978	0	633
Cancel All Units	2,315	66	0

Exhibit 17 opposite, shows that the cost advantage of completing Darlington declines substantially in the alternative scenarios. For example, cancelling two units costs $2.7 billion more than completing Darlington in Ontario Hydro's base case, but under Alternative #2 the penalty declines to $1.4 billion. The cost advantages of Darlington are able to withstand these changes in assumptons under Hydro forecasted load growth.

Under the assumptions of a lower load growth, a scenario the committee believes is possible, the combination of changes results in partial cancellation and cancellation becoming more favourable than completing Darlington (Exhibit 18, opposite). If Darlington is completed and Alternative Scenario #1 turns out to be true, then it will cost the province $36 million more than the optimal solution which would be to cancel units #3 and #4. If Alternative Scenario #2 occurs, then completing Darlington would cost $1.148 billon more than cancelling the entire project. The moderate scenario (Alternative Scenario #1) appears to be close to the point of indifference between continuing with Darlington and cancelling Units 3 and 4. **Although it is not probable, the feasibility of cancellation is certainly plausible, even with the project at such an advanced stage of completion.**

III. APPROPRIATE CONTROL OF ONTARIO HYDRO

Throughout this hearing many references were made to the appropriate level of control of Ontario Hydro. Similar references are often heard at public forums where Ontario Hydro's plans and operations are debated. This section of the report summarizes the issues raised before this Committee and the response the Committee intends to make to them.

The nature of the electric utility industry requires Ontario Hydro to make very long-term forecasts and plans. In order to determine whether additional generating capacity is needed, factors that influence demand and supply considerations decades ahead must be forecast and appropriate system expansion plans prepared. In order to bring Ontario Hydro under effective public control, it is necessary to have appropriate public scrutiny of the planning and forecasting process.

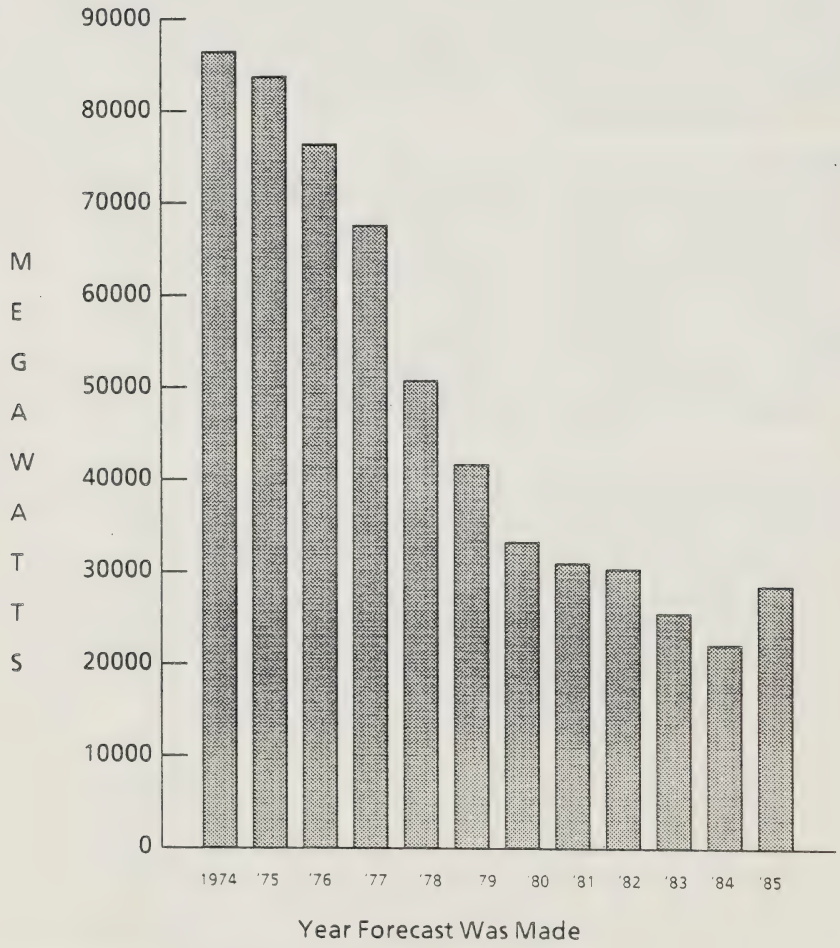
Darlington is an excellent example of the difficulty of gaining effective public control of Ontario Hydro. This Committee conducted the first open, public hearing into the planning of, and continuing need for, a multi-billion dollar public commitment. But, by the time this Committee hearing took place, the planning for the project was a decade old and about 65% of the costs of the plant were already committed. Even at this late date, when it appears probable that completing the project may be the best choice on strictly economic terms, it is still possible to envisage a future where the construction of part or all of the plant should be halted. Was there a point in the planning and construction where a more probable forecast would have led to the conclusion that construction should halt?

As Ontario Hydro does its planning, it forecasts values for many variables beyond its, or the government's, control, such as the exchange value of the Canadian dollar, the price of coal and the rate of inflation. It also makes assumptions and forecasts about factors over which the government could have influence such as the price of oil to Ontario consumers, the level of the Gross Provincial Product, and, implicitly, the vigour, effectiveness and targetting of energy conservation initiatives. Finally it forecasts values for factors over which both it and the government have influence, such as the effectiveness of electricity conservation initiatives, the impact of load management programs and the availability of alternative sources of electricity from co-generation, shared hydraulic developments and others.

The review of Darlington showed that Ontario Hydro can be at variance with the Ministry of Energy in its forecasts. The forecast assumptions Ontario Hydro presented the Committee to justify the project's continuance were at odds with the latest forecast assumptions of the Ministry of Energy on many important aspects. In some instances, such as the variation in estimates of Gross Provincial Product, the variances were not significant. However some other critical forecast assumptions, such as the price of other energy sources, the variances were considerable. The question is: should Ontario Hydro be planning for the future as it sees it, or should it be planning for the future that is foreseen by other government agencies?

EXHIBIT 19

CHANGES SINCE 1974 IN ONTARIO HYDRO'S LOAD FORECASTS OF PEAK DEMAND IN THE YEAR 2000



Source: John Robinson, University of Waterloo

To a certain extent, Ontario Hydro can determine its own future. This is especially true if Ontario Hydro and the government work together to influence key trends. Evidence from other jurisdictions indicates, for example, that the electricity intensity of the economy can be stimulated or depressed within a significant range as a matter of conscious policy choice. The Committee is concerned that the policy choices influencing the future may not be being made in the most appropriate place and may be made with more concern for protecting the narrower interests of Ontario Hydro from the broader interests of the province as a whole.

Conservation highlights this concern although it is certainly not the only example. Ontario Hydro claims to be supportive of conservation initiatives. But it is hard to give these claims much credibility when it is apparent that it is concerned with using its surplus generating capacity, when an Ontario Hydro witness demonstrated how certain conservation initiatives that benefit society may add cost to the electricity consumer and when responsibility for conservation and efficiency programs has no focus on the corporation. How is it that Ontario Hydro has come to believe that it has the latitude to make this kind of choice? Why are directions about the direction and intensity of conservation programming not coming from the Ministry?

Questions about the appropriateness and type of controls the government should have over its utility have been around for a long time. Task Force Hydro in 1972, the Select Committee on Ontario Hydro Affairs in the late 1970s and the Royal Commission on Electric Power Planning during the same period all addressed the questions and made recommendations. The answers do not yet appear to be satisfactory.

It seems that this is the moment when it may be possible to finally solve this longstanding public policy problem. Previous studies and recommendations were made at a time when Ontario Hydro's independent planning track record was extremely good. The Western world was scrambling to secure indigenous sources of energy against the new threat of OPEC. There was little appetite for questions about appropriate policy control; the watchword was "secure our energy future".

Today the situation is very different. Ontario Hydro is coping with the results of significant planning errors. Exhibit 19 shows that it now believes that its estimates of peak demand in the year 2000 were almost three times too high! Even as the forecasts were dropping Ontario Hydro was commissioning and building about 14,000 megawatts of nuclear power at a cost of billions. Today Ontario Hydro carries a surplus of generating capacity that may not diminish for 15 years. It is building its largest and most expensive project - Darlington - whose capacity is not needed and now can only be justified as a cost minimizing strategy.

For the first time in many years there is no urgent need to build the next stations. Ontario Hydro is currently completing the second phase of a three-phase fundamental review of demand and supply options. This is an outstanding opportunity for the government to participate in a meaningful way when its participation can be most meaningful in effectively controlling Ontario Hydro. To support that opportunity the Committee should be using the remainder of its term to determine in what ways government should be exerting its control and to suggest specific changes in the demand/supply options study.

Accordingly, the Committee recommends that

RECOMMENDATION 1:

Without limiting the scope of the Committee as set out in its terms of reference, the Committee should give priority to an examination of the relationship between the Government of Ontario and Ontario Hydro for the purposes of clarifying the relationship, setting out the specific responsibilities of each and defining the mechanisms that can activate the responsibilities.

RECOMMENDATION 2:

The Committee should undertake an independent review of the Ontario Hydro demand/supply options study backed by such expertise as may be required to illuminate specific and critical issues embodied in it.

IV. INTERIM CONCLUSION ON DARLINGTON

The analysis of Darlington presented in this report has demonstrated that it is not needed to meet demand until sometime between 1997 and 2005, and that it is desirable but not necessary to meet acid gas emission standards.

In assessing the economic merits of Darlington as a cost minimization strategy, three alternatives were reviewed:

1. Completing Darlington as planned

2. Cancelling Units 3 and 4, Completing Units 1 & 2

3. Cancelling all units

These alternatives were evaluated under a range of scenarios (varying primarily demand and financial variables). The cost advantages of Darlington appear likely to withstand a relatively wide range of changes in these variables. However, in the process of this review, serious concerns were raised about Hydro's planning process and the existence of barriers which may have, and may continue to, inhibit Hydro from pursuing alternatives which are consistent with the best interests of the public. Accordingly, the Committee has made two recommendations concerning the need to review Hydro's planning process and participation in a current demand/supply study at Hydro.

The Committee's third and final recommendation deals specifically with Darlington. At this time, there is not sufficient evidence to warrant the cancellation of Units 1 and 2. The Committee's analysis has shown that with 80% of the costs committed on these units, the cancellation option cannot be justified on an economic basis. However, less than 50% of the construction costs have been committed for Units 3 and 4 and the timing on these units is less critical, as they are not scheduled for commissioning until 1991/92. As well, the Committee is seeking important additional information about demand/supply options and will be reviewing the specific direction that government should give Ontario Hydro - direction that may ultimately affect the decision to cancel or proceed with Units 3 and 4. The Government's options should not be unduly restricted while these reviews are in progress.

The Committee, therefore, has considered three alternatives:

1. Stopping all activity on Units 3 and 4 until the Committee has completed its review.

2. Not allowing further contract commitments on Units 3 and 4 for materials that are not required for construction while the Committee's review is completed.

3. Letting Darlington continue uninterrupted.

Stopping all activity on Units 3 and 4 would continue the uncertainty at the Darlington site, result in schedule disruptions, have a negative impact on local employment in the short term and would likely result in cost increases.

On the other hand, letting Darlington continue would detract from the importance of the Committees future deliberations, and limit the government's flexibility to respond to new information that may be uncovered.

Holding further contract commitments on Units 3 and 4 that are not required for construction during the remainder of the Committee's review minimizes schedule disruptions while preventing further commitments of large additional sums of money. According to Ontario Hydro figures presented to the Committee and shown in Exhibit 13, the amount concerned could be a maximum of $350 million. This alternative provides time for the Committee to review the framework of Hydro's planning process and examine the status of the current demand/supply options study and for the government to implement recommendations arising from these studies before a large portion of the remaining discretionary funds are committed.

RECOMMENDATION 3:

No further contracts for Units 3 and 4 should be let for materials not required for construction during the next six months while the Committee studies demand and supply options.

DESSENTING OPINION

DISSENT: BY NEW DEMOCRATS

There is no justifiable reason to continue the construction of Darlington. Both the report of the Select Committee on Energy, and the evidence presented to the Committee, support this position. The electricity will not be needed until the next century, and Darlington is not likely to minimize the future cost of electricity. Instead, building Darlington will effectively curtail the development of alternative sources of electricity and the implementation of electrical efficiency. Although $7 billion have been committed to Darlington, at least $4 billion, and possibly more, can still be saved.

For over a decade New Democrats have registered our opposition to the construction of the Darlington Nuclear Generating Station. Our opposition has been based on several factors, a key consideration being the unfavourable economics of the project.

Ontario Hydro, on the other hand, has been adamant that the Darlington Station is necessary, and is, in fact, the least cost alternative to other energy options.

Now, after a preliminary investigation into the economic feasibility of continuing to build Darlington, the report prepared by the Select Committee on Energy reaches several very significant conclusions which differ from Hydro's contentions.

This report is also the first review of Darlington by anyone other than Ontario Hydro. We believe that the arguments made in this report support the cancellation of Darlington.

Out of three criteria which the report examines to determine whether Darlington is needed, Darlington fails on two counts and is marginal on the basis of the third criterion. Furthermore, there are assumptions in the third criterion which do not even make Darlington marginally acceptable on economic grounds.

The three criteria which the Select Committee examined are: 1) whether the electrical capacity of Darlington is needed, 2) whether Darlington is justified as a means of meeting acid gas emission standards, and 3) whether Darlington can be justified to minimize the costs of electricity.

The report is definitive in rejecting the first two criteria as arguments for continuing with Darlington:

o Its very reasonable examination of Hydro's electrical generating capacity shows that the electricity from Darlington "is not needed to meet demand until the turn of the century — 12 years after the first unit is scheduled to begin production" (Section II, page 1). The Committee assumes in this projection that Ontario Hydro will make modest improvements in electrical intensity as other jurisdictions have, thereby reducing the probable load growth to 2 per cent each year.

o Meeting environmental standards for acid gas emissions is not a justification for building Darlington (Section II, page 12).

Even on the third criteria -- whether Darlington can be justified as a way of minimizing the costs of electricity — the report leaves considerable room for doubt that Darlington will be able to minimize the cost of electricity in the future.

In addressing the question of cost minimization, the report finds that cancellation may still be an economical choice, even with 65% of the project's costs already committed.

The report states, for example, in Section II, page 17, that "the feasibility of cancellation is certainly plausible, even with the project at such an advanced stage of completion". Further on, at the beginning of Section IV, the report also concedes that "there are at least legitimate doubts that it (Darlington) will actually reduce the average cost of generation". Both these statements raise significant questions about the economic desirability of continuing with Darlington.

The original analysis on the ability of Darlington to minimize the future cost of electricity was done by Ontario Hydro and assumes that the alternative to supplying electricity from Darlington is the construction of an equivalent coal-fired generating station. The Committee's report uses Hydro's model to construct another simple model which it uses to test different variables. The report states that its "analysis shows that the cost advantage of continuing with Darlington Nuclear Generating Station depends most on load growth, discount rate and coal prices". We do not agree with many of Hydro's policies which heavily influence the factors taken into account in their models.

With respect to load growth, Hydro has consistently overestimated this factor. For years they have ignored the falling demand for electricity in the province and consequently designed and built a system much larger than needed. As a result of their overbuilt system, Hydro now aggressively markets electricity use rather than focussing on conservation. The demand for electricity that Ontario Hydro anticipates may not materialize. Furthermore, Ontario Hydro should be directed to plan for a lower growth in demand and to effectively manage the growth in its system capacity accordingly.

However, even using Hydro's own model as a basis and Hydro's possible low growth scenario, the report finds that "under the assumptions of a lower load growth, a scenario the Committee believes is possible, the combination of changes results in partial cancellation and cancellation becoming more favourable than completing Darlington" (Section II, page 16).

Therefore, we are convinced that even at this point in the construction of Darlington, cancellation is still an economically viable option and the most attractive choice for the province.

Another crucial factor in Hydro's economic justification of Darlington is the comparison of nuclear-produced electricity with coal-generated electricity to prove that the nuclear option is more attractive. We do not accept coal-fired generation of electricity as the preferred alternative to nuclear power, and we therefore do not accept the use of this alternative as a basis for determining the cost efficiency of Darlington.

Rather, we have always encouraged Hydro to develop small-scale hydro potential in the province and to implement conservation and the efficient use of energy. If Hydro were sincerely concerned with finding the low cost alternative, these alternatives would be developed first and Hydro would have no reason to continue with Darlington. The continuation of Darlington will mean that Hydro has no incentive to develop any alternative sources of electricity for the next 15 years.

Hydro has told the Committee, and confirmed in recent public statements, that they intend to increase the buy-back rate, the rate which they pay to small producers of electricity, by the time Darlington is completed in 1992 to a rate that is even higher than the price of electricity generated by Darlington. If Hydro wants to encourage the development of alternative sources of energy, increases in the buy-back rate should be instituted immediately. This would allow small generators of electricity to start projects now which would be available within the next few years.

We have concluded, then, that the assumptions which have been made to demonstrate the cost efficiency of Darlington are not assumptions we share. Darlington cannot be economically justified using projections of high growth and using the comparison of the costs of building nuclear-generated electrical capacity with coal-fired generating capacity. Hydro can, and should, implement policies that would control growth and develop less costly alternatives.

In addition to our concerns that Darlington is not an economical choice for our supply of electricity, we have other concerns about the environmental ramifications of the continued development of nuclear power which are not addressed in this report, specifically the unresolved question of the disposal of nuclear waste.

CONCLUSION

Darlington should be cancelled. The report of the Committee, as well as the evidence presented to it, supports our position. Darlington fails two of the Committee's three criteria and is marginal on the third. Therefore, it would not be wise to continue with Darlington in the flimsy hope that it would minimize the cost of electricity when it is clear that if Hydro pursued different policies the goal of providing inexpensive electricity could be more readily accomplished.

Brian Charlton, MPP
Hamilton Mountain

Ruth Grier, MPP
Lakeshore

APPENDICES

APPENDIX A

Agenda of the Select Committee on Energy

Monday, August 26, 1985 **THUNDER BAY**

8:40 a.m.	Depart from Toronto.
10:55 a.m.	Arrive Thunder Bay. Pat O'Brien, Corporate Relations Officer.
11:30 a.m.	Thunder Bay Terminal. Jack Carr, Manager.
12:30 p.m.	Thunder Bay Generating Station. Ray Gibson, Manager.
3:15 p.m.	Arrive Northwestern Regional Office. Jack Hamer, Director.
4:30 p.m.	Arrive Kakabeka Falls.
7:15 p.m.	Depart from Thunder Bay.
9:15 p.m.	Arrive Toronto.

Tuesday, August 27, 1985 DARLINGTON AND PICKERING

9:30 a.m.	Arrive at Darlington Information Centre. John McCredie, Project Manager.
9:45 a.m.	Commence extensive tour of site.
1:30 p.m.	Arrive Pickering Energy Information Centre. Briefed by Ken Talbot, Commissioning Manager.
2:00 p.m.	Tour of Pickering 'A'and 'B' including retubing and storage bays.
3:00 p.m.	Simulator Building. Pierre R. Charlebois, Manager, Eastern Nuclear Training Centre.
5:00 p.m.	Return to Toronto.
6:00 p.m.	Arrive at Queen's Park.

Wednesday, August 28, 1985 **NIAGARA FALLS AND NANTICOKE**

10:00 a.m.	Arrive Sir Adam Beck G.S., Niagara Falls. Chuck Sands, Plant District Superintendent.
11:30 a.m.	Toronto Power. Tom Gardner, Decew District Superintendent.
1:30 p.m.	Arrive Port Dover.
2:00 p.m.	Arrive Nanticoke G.S. Harry Kirwin, Station Manager.
4:00 p.m.	Depart for Toronto.
6:00 p.m.	Arrive at Queen's Park.

Thursday, August 29, 1985 BRUCE N.G.S.

9:00 a.m.	Helicopters via Malton Line.
10:30 a.m.	Arrive Bruce Nuclear Power Development.
10:40 a.m.	Administration auditorium for site orientation.
11:15 a.m.	Bus tour of Bruce Heavy Water facility.
11:30 a.m.	Bus tour of Central Services and Western Nuclear Training Centre.
12:00 noon	Bus tour of Bruce 'A'.
1:45 p.m.	Bus tour of Bruce Energy Centre and steam line.
2:00 p.m.	In-plant tour of Bruce 'B', including vault.
3:00 p.m.	Rick Campbell briefs the Committee on transmission; recommended routes.
3:30 p.m.	Bruce Helicopter pad. Depart via recommended transmission route.
5:00 p.m.	Return Helicopter Malton and from there members own transportation.

Friday, August 30, 1985	HYDRO HEAD OFFICE (TORONTO)
8:45 a.m.	Arrive Hydro Place Auditorium. Dev Chopra, Manager, Head Office and Kipling Facilities.
9:15 a.m.	Tour Hydro Departments.
10:10 a.m.	620 University - Marketing - Dane McCarthy, Vice-President.
11:00 a.m.	Hydro Place - Engineering - Bill Morison, Vice-President, Design and Construction. G. Mackie, Director, Project and Construction. R. Murray, Director, Design and Transmission. H. Erving, Director, Design. L. Milton, Director, Land Use and Environmental Planning.
1:30 p.m.	Richview Control Centre. Wes Lawler, Manager, System Operation.
4:00 p.m.	Return to Queen's Park.

Tuesday, September 10, 1985

10:00 a.m. Introduction and Review of Schedule

Mr. Brent Snell

10:20 a.m. Ontario Hydro

1. Opening Remarks
   Mr. T. Campbell

2. Overview of Electric Service in Ontario

   Mr. T. Campbell
   with:
   Mr. M. Nastich
   Mr. A. Niitenberg
   Mr. R. Bartholomew

3. Planning for Future Needs

   Mr. T. Campbell
   with:
   Mr. M. Nastich
   Mr. S. Horton
   Mr. A. Hill

12:30 p.m. LUNCH

Tuesday, September 10, 1985 (Continued)

2:00 p.m.

4. Presentation Outline on Committed Generation
   Mr. L. G. McConnell

5. The Basis for Electrical Planning,
   the Role of Conservation and Managing
   Customer Demand

   a. Mission and values
      Mr. M. Nastich

   b. Ontario Perspective
      Mr. L. G. McConnell

   c. Demand Management
      Mr. E. A. Marriage

Wednesday, September 11, 1985

10:00 a.m. Ontario Hydro (Continued)

6. Load Forecasts and the Need for Generating Facilities

   a. Load Forecasts
      Mr. C. Mackay-Lassonde

   b. Requirements
      Mr. E. A. Marriage

   c. Reasons for Generation
      Mr. E. A. Marriage

7. Installed and Committed Generation Capacity and its Future Replacement

   a. Existing Generation
      Mr. A. Hill

   b. Replacement
      Mr. A. Hill

   c. Committed
      Mr. J. McCredie

12:30 p.m. LUNCH

Wednesday, September 11, 1985 (Continued)

2:00 p.m. Ontario Hydro (Continued)

8. Utilization of Planned Facilities
   Their Performance, and Coal and Uranium
   Supply

   a. Utilization of Committed Generation
      Mr. M. Huggins

   b. Uranium and Coal
      Mr. A. Holt

   c. Performance
      Mr. A. Jackson

Thursday, September 12, 1985

10:00 a.m. Ontario Hydro (Continued)

9. Alternatives to the Committed Generation Program - Renewable Sources

   a. Evaluation Factors
      Mr. L. G. McConnell

   b. Other Alternatives (except Coal)
      Mr. A. Shalaby

12:30 p.m. LUNCH

2:00 p.m. Ontario Hydro (Continued)

10. Coal as an Alternative
    Mr. A. Hill
    Mr. E. A. Marriage

11. Closing Remarks
    Mr. L. G. McConnell

Monday, September 16, 1985 HEARING IN BOWMANVILLE

8:30 a.m.	- To meet at the Front of the main Entrance of the Legislative Building - Transportation will be waiting for Travelling to The Flying Dutchman Motel, Bowmanville, Ontario.
	APPEARING:
10:00 a.m.	Mr. Gerry Herrama, Chairman Mr. G. Gervais, Executive Assistant Regional Municipality of Durham
10:30 a.m.	Mayor G. B. Rickard Mrs. M. Hubbard, Councillor Mr. B. Taylor, Councillor Town of Newcastle
11:00 a.m.	Mrs. Joey Burns Mrs. F. Tregenza Mrs. S. L. Ostrander Citizens for Darlington Nuclear Survival
11:30 a.m.	Mr. Quintin Bedd United Brotherhood of Carpenters
12:00 a.m.	Mr. Joe Koene
	LUNCH
2:00 p.m.	Mr. N. Marshall, Town Manager Town of Pickering
2:30 p.m.	Mr. B. Shewchuck Realtor Representative
3:00 p.m.	Mr. Bob Rutherford Durham Region Coalition for Nuclear Responsibility
3:30 p.m.	Mr. Bill Fairservice Local 597

Monday, September 16, 1985 HEARING IN BOWMANVILLE (Continued)

4:00 p.m.	Mr. Jeff Brackett
4:30 p.m.	Mr. Ben Burd President Cobourg and District Labour Council
5:00 p.m.	Mayor Wm. Wyatt Town of Port Hope
	DINNER
7:30 p.m.	Mr. John Turner, M.P.P. Peterborough
7:45 p.m.	Ms. P. Lawson
8:00 p.m.	Mr. Harry Tensen
8:30 p.m.	Mr. Bill Borger, Teacher Mr. D. Black, Student Ms. C. Malkin, Student Ms. J. Davis, Student South Glenville District High School (Prescott)
9:00 p.m.	Professor Cyril Carter Trent University

Tuesday, September 17, 1985 - IN TORONTO

APPEARING:

10:00 a.m.	Allied Construction Trades Council
	Provincial Building and Construction Trades Council of Ontario
	Toronto Central Ontario Building and Construction Trades Council
	International Union of Bricklayers and Allied Craftsman
	International Association of Bridge, Structural and Ornamental Iron Workers
	International Brotherhood of Boilers Makers, Ironship Builders, Blacksmith, Forgers and Helper
	Mr. Alan Minsky, Solicitor Mr. Joe Duffy Mr. Clive Ballantine Mr. P. Gauthier Mr. J. J. Marchildon
11:00 a.m.	Mr. Joe Howieson, President Mr. P. Russ-Russ, Engineer Canadian Nuclear Society
11:15 a.m.	Mr. James Donnelly, President and C.E.O. Mr. Don Lawson, President of Candu Operations Atomic Energy of Canada Ltd.
12:00 p.m.	Alderman R. Gilbert City of Toronto
12:30 p.m.	LUNCH
2:00 p.m.	Mr. Peter Dundas Ms. P. Cross Mr. P. Onstein Kingston Thousand Islands Action Group Against Darlington
2:30 p.m.	Mr. George Ward Ontario Sheet Metal Conference
3:00 p.m.	Mr. Thomas Berry
3:30 p.m.	Mr. R. Tersigni, Executive Secretary-Treasurer International Brotherhood of Electrical Workers
4:00 p.m.	Mr. John Harding
4:15 p.m.	Mr. P. D. O'Brien

Wednesday, September 18, 1985 - IN TORONTO

	APPEARING:
10:00 a.m.	Mayor R. Taylor Town of Elliot Lake
10:30 a.m.	Mr. Jack MacDonald, President Mr. N. McIntosh, Vice-President Ontario Hydro Employees' Union
11:00 a.m.	Mr. B. Rowney, President Mr. E. Noates Mr. Charles Macaluso Ontario Municipal Electrical Association
11:30 a.m.	Mr. David Martin Toronto Nuclear Awareness
12:15 p.m.	Mr. Glenn Sutton, Member Kincardine Industrial Committee
12:30 p.m.	LUNCH
2:00 p.m.	Dr. H. R. Andrews, Chairman Mr. M. Harvey Committee on Public Issues Society of A.E.C.L. Professional Employees
2:45 p.m.	Mr. Jack Shankula, President Mr. J. Murphy, Former President Chalk River Technicians and Technologists Union
3:30 p.m.	Mayor Lyall Smith Town of Deep River
	Dr. J. Hardy Dr. A. Miller The Citizen Group of Upper Ottawa Valley
4:15 p.m.	Mr. Lloyd Greenspoon, Member Mr. E. Burt, Member Algoma Manitoulin Nuclear Awareness

Friday, September 20, 1985 - IN TORONTO

	APPEARING:
8:30 a.m.	"In Camera" Meeting
1:30 p.m.	Mr. D. Armour, President Mr. N. Purdy, Member Dr. H. Goodfellow, Member Mr. Sandar Raj, Secretary Joint Industry Task Force
2:15 p.m.	Mr. John Lind, Chairman Mr. Keith Kidd, Consulting Engineer Association of Major Power Consumers of Ontario
3:15 p.m.	Mr. C. M. Bailey, President Federation of Engineering and Sciantific Associations
	And
4:00 p.m.	Mr. K. Johanson, Vice-President The Society of Ontario Hydro Professional and Administrative Employees

Wednesday, September 25, 1985 - EXPERT WITNESSES

	APPEARING:
	Ministry of Treasury and Economics
10:00 a.m.	Don McColl, Assistant Deputy Minister, Office of the Treasury
	R.J. Watson, Director, Finance Management Branch
	R.D. Christie, Assistant Director, Finance Management Branch
	Ms. P.M. Clark, Senior Economist, Finance Management Branch
10:45 a.m.	Mr. Paul Parshley, Vice-President Donaldson, Lufkin and Jenrette
12:30 p.m.	LUNCH
1:30 p.m.	Mr. Paul Mckay
2:15 p.m.	Mr. Ralph Nader
4:00 p.m.	

Thursday, September 26, 1985 - EXPERT WITNESSES

	APPEARING:
10:00 a.m.	Mr. Amory Lovins Rocky Mountain Institute
11:45 a.m.	Mr. John Robinson, Professor Department Man-Environment Studies University of Waterloo
12:30 p.m.	LUNCH
2:00 p.m.	Mr. Jeff Passmore, Mr. David Argue, Energy Consultants
3:15 p.m.	Canadian Nuclear Association
	Mr. Gavin Warnock, Chairman Mr. W. MacOwan, Vice-Chairman Corporate Development Howden Group Canada
	Mr. W. H. Bulger, Vice-President, Donlee Manufacturing Industry Ltd. (Toronto)
	Mr. J. R. Ackeroyd, Manager Nuclear Department Babcock and Wilcox, Canada

Friday, September 27, 1985 - EXPERT WITNESSES

	APPEARING:
9:00 a.m.	Mr. Charlie Dean Chairman Tennessee Valley Authority
10:30 a.m.	Mr. Stanford Levin Commissioner Illinois Commerce Commission
12:00 p.m.	LUNCH
1:30 p.m.	Mr. Norman Rubin, Researcher Mr. David Poch, Legal Council Mr. Lawrence Solomon, Researcher Energy Probe
4:30 p.m.	

Monday, September 30, 1985 - **IN TORONTO**

10:00 a.m.	MINISTRY OF ENERGY
	APPEARING:
	Mr. B. MacOdrum Assistant Deputy Minister, Energy Policy and Planning Division
	Mr. P. Shervill Manager, Electricity Section
	Mr. C. Jutlah Manager, Economics and Forecasts Section
	Ms. J. Lam Manager, Oil and Gas Section
12:30 p.m.	LUNCH
	NUCLEAR WASTE MANAGEMENT
2:00 p.m.	Mr. T. Carter, Engineer Mr. Bill Morison, Vice-President Engineering and Construction Ontario Hydro
3:00 p.m.	Mr. Sudesh Singh Materials Research Laboratories Ltd.

Tuesday, October 1, 1985 - IN TORONTO

10:00 a.m.	Mr. Mike Gent, President North American Electric Reliability Council
11:15 a.m.	Mr. Tom Keelin, Principal Strategic Decision Group
12:30 p.m.	LUNCH
2:00 p.m.	Mr. Charles Komanoff Komanoff Energy Associates

Wednesday, October 2, 1985 - **IN TORONTO**

10:00 a.m.	ONTARIO HYDRO
and	APPEARING:
2:00 p.m.	
	Introduction Opening Remarks Mr. M. Nastich
	Presentation Outline Mr. L. McConnell
	Select Committee Mr. A. Hill Mr. R. Bartholomew

Thursday, October 3, 1985 - **IN TORONTO**

10:00 a.m.	ONTARIO HYDRO
	APPEARING:
	Other Presentors -
	Response
	Mr. S. Horton
	Mr. K. Snelson
12:30 p.m.	LUNCH
2:00 p.m.	ONTARIO HYDRO
	Response Presentations
	Ontario Nuclear Program
	Mr. L. McConnell
	Mr. J. Wilson
	Conservation/Selling
	Mr. D. MacCarthy
	Mr. F. Kee

Friday, October 4, 1985 - IN TORONTO

10:00 a.m.	ONTARIO HYDRO
	APPEARING:
	Buy-Back Pricing Mr. A. Niitenberg
	Review Presentation Mr. L. McConnell
	Closing Remarks Mr. T. Campbell
12:30 p.m.	LUNCH
2:00 p.m.	Mr. Ralph Torrie

Wednesday, October 9, 1985 - IN TORONTO

10:00 a.m.	Mr. Terry Burrell
12:30 p.m.	LUNCH
2:00 p.m.	Honourable Vince Kerrio Minister of Energy

APPENDIX B

List of Witnesses

WITNESSES LIST

1. Mr. J. R. Ackroyd
   Manager, Nuclear Department
   Babcock and Wilcox, Canada

2. Dr. H. R. Andrews
   Chairman
   The Society of A.E.C.L.
   Professional Employees

3. Mr. D. Argue
   Energy Consultant
   Ottawa, Ontario

4. Mr. D. Armour
   President
   Joint Industry Task Force
   Toronto, Ontario

5. Mr. C. M. Bailey
   President
   Federation of Engineering and Sciantific
   Associations of Ontario

6. Mr. G. Baker
   Nuclear Facilities Service
   Bruce G. S.

7. Mr. C. Ballantine
   Member of Council
   The Allied Construction Trades Council of
   Ontario

8. Mr. R. Bartholomew
   Vice-President Finance
   Ontario Hydro

9. Mr. B. Bedd
   Business Manager
   United Brotherhood of Carpenters
   Oshawa, Ontario

10. Mr. T. Berry
    Private Citizen
    Etobicoke, Ontario

11. Mr. D. Black
Student
South Glenville District High School
Prescott, Ontario

12. Mr. B. Borger
Teacher
South Glenville District High School
Prescott, Ontario

13. Mr. J. Brackett
Private Citizen
Town of Newcastle, Ontario

14. Mr. W. H. Bulger
Vice-President
Donlee Manufacturing Industry Ltd. (Toronto)

15. Mr. B. Burd
President
Cobourg and District Labour Council
Cobourg, Ontario

16. Mrs. J. Burns
Member of
Citizens for Darlington Nuclear Survival
Town of Newcastle, Ontario

17. Mr. T. Burrell
Energy Consultant
Toronto, Ontario

18. Mr. E. Burt
Member of
The Algoma Manitoulin Nuclear Awareness

19. Mr. R. Campbell
Community Relations
Ontario Hydro

20. Mr. T. Campbell
Chairman
Ontario Hydro

21. Mr. J. Carr
General Manager and President
Thunder Bay Terminal Ltd.
Thunder Bay, Ontario

22. Professor C. Carter
Trent University
Peterborough, Ontario

23. Mr. T. J. Carter
Engineer, Radioactive, Materials Management
Ontario Hydro

24. Mr. C. Charlebois
Manager
Eastern Nuclear Training Centre
Pickering G. S.

25. Mr. D. Chopra
Manager
Head Office and Kipling Facilities
Ontario Hydro

26. Mr. R. D. Christie
Assistant Director, Finance Management Branch
Ministry of Treasury and Economics

27. Ms. P. M. Clark
Senior Economist, Finance Management Branch
Ministry of Treasury and Economics

28. Ms. P. Cross
Member of the
Kingston Thousand Island Action Group
Kingston, Ontario

29. Mr. L. Crossing
Construction Manager
Darlington G. S.

30. Mr. B. Cutts
Manager
Bruce G. S. 'A'

31. Mr. D. Davidson
Manager
Heavy Water Plant
Bruce G. S.

32. Ms. J. Davis
Student
South Glenville District High School
Prescott, Ontario

33. Mr. C. Dean
Chairman, Tennessee Valley Authority
Knoxville, Tennessee

34. Mr. J. Donnelly
President
Atomic Energy of Canada
Ottawa, Ontario

35. Mr. J. Duffy
Member of Council
The Allied Construction Trades Council of
Ontario

36. Mr. P. Dundas
Member of the
Kingston Thousand Island Action Group
Kingston, Ontario

37. Mr. K. Elston
Operations Manager
Bruce G. S.

38. Mr. H. Erving
Director, Designing
Ontario Hydro

39. Mr. R. Forchette
Manager
Northwestern Regional Office
Thunder Bay, Ontario

40. Mr. T. Gardner
Decew District Superintendent
Toronto Power
Niagara Falls, Ontario

41. Mr. P. Gauthier
Member of Council
The Allied Construction Trade Council of
Ontario

42. Mr. M. Gent
President, North American Electric
Reliability Council
Princeton, N.J.

43. Mr. G. Gervais
Executive Manager
The Regional Municipality of Durham
Ontario

44. Alderman R. Gilbert
City of Toronto

45. Mr. L. Greenspoon
Member of
The Algoma Manitoulin Nuclear Awareness
Ontario

46. Mr. J. Harding
Private Citizen
Toronto, Ontario

47. Dr. J. Hardy
Member of
The Citizen Group of Upper Ottawa Valley
Ontario

48. Mr. M. Harvey
Member
The Society of A.E.C.L.
Professional Employees

49. Mr. G. Herrama
Chairman
The Regional Municipality of Durham
Ontario

50. Mr. A. Hill
Director of System Planning Division
Ontario Hydro

51. Mr. A. Holt
Station Manager
Bruce G. S. 'B'

52. Mr. A. Holt
Director, Fuels Division
Ontario Hydro

53. Mr. E. Horton
Director, Nuclear Generating Division
Ontario Hydro

54. Mr. S. Horton
Executive Vice-President
Engineering and Services
Ontario Hydro

55. Mr. J. Howieson
President
The Canadian Nuclear Society
Ottawa, Ontario

56. Mrs. M. Hubbard
Councillor
Town of Newcastle, Ontario

57. Mr. M. Huggins
Senior Planning Engineer, General Evaluation and
Special, System Planning Division
Ontario Hydro

58. Mr. K. Johanson
Vice-President
The Society of Ontario Hydro
Professional and Administrative Employees

59. Mr. D. Johnson
Administrator
Town of Newcastle, Ontario

60. Mr. C. Jutlah
Manager, Economics and Forecasts Section
Ministry of Energy

61. Mr. F. Kee
Director of Research
Ontario Hydro

62. Mr. T. Keelin
Principal, Strategic Decision Group
Menlo Park, California

63. Honourable Vince Kerrio
Minister of Energy of Ontario

64. Mr. K. Kidd
Consulting Engineer for the Association of Major
Power Consumers of Ontario

65. Mr. H. Kirwin
Station Manager
Nanticoke G. S.
Port Dover, Ontario

66. Mr. J. Koene
Student
Bowmanville, Ontario

67. Mr. C. Komonoff
Komonoff Energy Associates
New York, N.Y.

68. Ms. J. Lam
Manager, Oil and Gas Section
Ministry of Energy (Ontario)

69. Mr. W. Lawler
Manager, System Operation
Richview Swetching Centre
Ontario Hydro

70. Mr. D. Lawson
President of Candu Operations
Atomic Energy of Canada
Ottawa, Ontario

71. Ms. P. Lawson
Private Citizen
Town of Port Hope, Ontario

72. Mr. S. Levin, PhD.
Commissioner
Illinois Commerce Commission

73. Mr. J. Lind
Chairman
Association of Major
Power Consumers of Ontario

74. Mr. A. Lovins
Rocky Mountain Institute
Colorado, USA

75. Mr. D. MacCarthy
Vice-President, Marketing
Ontario Hydro

76. Mr. J. Macdonald
President
Ontario Hydro Employees Union

77. Mr. N. MacIntosh
Vice-President
Ontario Hydro Employees Union

78. Mr. C. C. Macaluso
Researcher for the Ontario Municipal
Electrical Association

79. Mr. G. Mackie
Director, Project Construction
Ontario Hydro

80. Mr. B. MacOdrum
Assistant Deputy Minister, Energy Policy and
Planning Division
Ministry of Energy (Ontario)

81. Mr. W. MacOwan
Vice-Chairman, Corporate Development
Howden Group Canada

82. Ms. C. Malkin
Student
South Glenville District High School
Prescott, Ontario

83. Mr. J. J. Marchildon
International Representative of Operative Plasters
and Cement Masons of Ontario

84. Mr. A. Marriage
Manager
Bes Resources Planning
Ontario Hydro

85. Mr. N. Marshall
Town Manager
Town of Pickering, Ontario

86. Mr. D. Martin
Member
Toronto Nuclear Awareness

87. Mr. D. S. McColl
Assistant Deputy Minister, Office of the Treasury
Ministry of Treasury and Economics

88. Mr. L. G. McConnell
Vice-President
Power System Program
Ontario Hydro

89. Mr. J. McCredie
Project Manager
Darlington G. S.

90. Mr. P. McKay
Author
Landsdowne, Ontario

91. Ms. C. McKay-Lassonde
Manager
Load Forecast Economics and Forecasts Division
Ontario Hydro

92. Dr. A. Miller
Member of
The Citizen Group of Upper Ottawa Valley
Ontario

93. Mr. L. Milton
Director
Land Use and Environmental Planning
Ontario Hydro

94. Mr. A. Minsky
Solicitor for
The Allied Cosntruction Trades Council of
Ontario

95. Mr. B. Morison
Vice-President
Design and Cosntruction
Ontario Hydro

96. Mr. J. Murphy
Past President
The Chalk River Technicians and Technologists
Ontario

97. Mr. B. Murray
Director, Design and Development
Division, Transmission
Ontario Hydro

98. Mr. R. Nader
American Program Bureau
Chestnut Hill, MA, USA

99. Mr. M. Nastich
President
Ontario Hydro

100. Mr. A. Niitenberg
Executive Vice-President Operations
Ontario Hydro

101. Mr. E. Noates
Vice-President
The Ontario Municipal Electrical Association

102. Mr. P. D. O'Brien
Private Citizen
Toronto, Ontario

103. Mr. P. O'Brien
Corporate Relations Officer
Northwestern Regional Office
Thunder Bay, Ontario

104. Mr. P. Onstein
Member of the
Kingston Thousand Island Action Group
Kingston, Ontario

105. Mrs. S. L. Ostrander
Member of
Citizens for Darlington Nuclear Survival
Town of Newcastle, Ontario

106. Mr. Paul Parshley
Vice-President
Donaldson, Lufkin and Jenrette
New York, NY, USA

106A. Mr. J. Passmore
Energy Consultant
Ottawa, Ontario

107. Mr. D. Poch
Legal Council
Energy Probe (Toronto)

109. Mr. S. Raj
Secretary
Joint Industry Task Force

110. Mr. G. B. Richard
Mayor of the Town of Newcastle
Ontario

111. Mr. J. Robinson
Professor
Department of Man-Environment Studies
University of Waterloo

112. Mr. M. Rothman
Chief Economist
Economics and Forecasts Division
Ontario Hydro

113. Mr. B. Rowney
President
The Ontario Municipal Electrical Association

114. Mr. N. Rubin
Researcher
Energy Probe (Toronto)

115. Dr. T. E. Rummery
Director, Whiteshell Nuclear Research Establishment
Pinawa, Manitoba

116. Mr. P. Russ-Russ
Engineer and Member of
The Canadian Nuclear Society
Ottawa, Ontario

117. Mr. B. Rutherford
Member
Durham Region Coalition for Nuclear Responsibility
Town of Newcastle, Ontario

118. Mr. C. Sands
Plant District Superintendent
Sir Adam Beck G. S.
Niagara Falls, Ontario

119. Mr. E. Seppola
Construction Manager
Sir Adam Beck G. S.
Niagara Falls, Ontario

120. Mr. A. Shalaby
Supervising Planning Engineer Supply Planning
Ontario Hydro

121. Mr. J. Shankula
President
The Chalk River Technicians and Technologists Union
Ontario

122. Mr. P. Shervill
Manager, Electricity Section
Ministry of Energy (Ontario)

123. Mr. B. Shewchuk
Realtor Representative
Bowmanville, Ontario

124. Mr. S. Singh
President, Materials Research Laboratories Ltd.
Nepean, Ontario

125. Mr. J. Smith
Vice-President, Corporate Relations
Ontario Hydro

126. Mr. L. Smith
Mayor Deep River, Member of
The Citizen Group of Upper Ottawa Valley, Ontario

127. Mr. K. Snelson
Assistant to the Director of System Planning
Ontario Hydro

128. Mr. L. Solomon
Researcher
Energy Probe (Toronto)

129. Mr. S. Strickley
Community Public Relations
Darlington G. S.

130. Mr. G. Sutton
Member
The Town of Kincardine Industrial Committee
Kincardine, Ontario

131. Mr. K. Talbot
Commissioning Manager
Pickering G. S.

132. Mr. B. Taylor
Councillor
Town of Newcastle, Ontario

133. Mr. R. Taylor
Mayor of Elliot Lake
Ontario

134. Mr. H. Tensen
Teacher
Town of Newcastle, Ontario

135. Mr. R. Tersigni
Executive Secretary-Treasurer
The International Brotherhood of Electrical Workers
of Ontario

136. Mr. M. Torrie
Assistant to the Director of System Planning
Ontario Hydro

137. Mr. G. Treblecock
Engineering Department
Pickering G. S.

138. Mrs. F. Tregenza
Member of
Citizens for Darlington Nuclear Survival
Town of Newcastle, Ontario

139. Mr. J. Turner, M.P.P.
Riding of Peterborough, Ontario

140. Mr. G. Ward
Business Manager
Ontario Sheet Metal Conference

141. Mr. G. Warnock
Chairman
Canadian Nuclear Association

142. Mr. R. J. Watson
Director, Finance Management Branch
Ministry of Treasury and Economics

143. Mr. D. White
Community Relations Officer
Bruce G. S.

144. Mr. G. Whitney
Manager
Kaka Beka Falls, Generation Station

145. Mr. G. Williams
Manager
Steam Plant
Bruce G. S.

146. Mr. J. Wilson
Director, Health and Safety
Ontario Hydro

147. Mayor Wm. Wyatt
Town of Port Hope, Ontario

148. Mr. H. Zuzek
Manager Construction
Bruce G. S.

APPENDIX C

List of Exhibits

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST

ONTARIO HYDRO

Exhibit No. 1.	From Ontario Hydro Corporation Briefing material on Committee tour of Hydro facilities.
Exhibit No. 2.	From Ontario Hydro Corporation Bruce to Milton 500 KV Line.
Exhibit No. 3.	From Ontario Hydro Corporation Proposed Bruce to Essa Single Circuit 500 KV Line.
Exhibit No. 4.	Letter from Foster Creek Developments Ltd. to the Committee.
Exhibit No. 5.	Research Paper prepared by Jerry Richmond Research Officer to the Committee entitled "Excerpts from Reports of Select Committee on Hydro Affairs (1977 - 8)".
Exhibit No. 6.	Research Paper prepared by Jerry Richmond Research Officer to the Committee entitled "Overview of Darlington Nuclear Station".
Exhibit No. 7.	Overview of Committee meetings prepared by Mr. Brent Snell, Consultant to the Committee.
Exhibit No. 8.	Report entitled "Review of Darlington Report 630SP, January 1984" presented to the Committee by Mr. Brent Snell, Consultant to the Committee.
Exhibit No. 9A.	Presentation to the Committee by Ontario Hydro, Mr. T. Campbell, Chairman, Section 2.
Exhibit No. 9B.	Section 3. - Mr. T. Campbell.
Exhibit No. 9C.	Section 4. - Mr. L.G. McConnell.
Exhibit No. 9D.	Section 5. - Mr. M. Nastich.
Exhibit No. 9E.	Section 5-B. - Mr. L.G. McConnell.
Exhibit No. 9F.	Section 5-C. - Mr. E. A. Marriage.
Exhibit No. 9G.	Section 6-A. - Ms. C. MacKay - Lassonde.
Exhibit No. 9H.	Section 6-B. - Mr. E. A. Marriage.
Exhibit No. 9I.	Section 7-A. - Mr. A. Hill.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 9J.	Section 7-B. - Mr. J. McCredie.
Exhibit No. 9K.	Section 8-A. - Mr. M. J. Huggins.
Exhibit No. 9L.	Section 8-B. - Mr. A. Holt.
Exhibit No. 9M.	Section 8-C. - Mr. H. A. Jackson.
Exhibit No. 9M(I).	World Nuclear Power Reactor Performance 1984, Report. (Ontario Hydro NG. D-12).
Exhibit No. 9N.	Section 9. - Mr. L.G. McConnell.
Exhibit No. 9O.	Section 9B. - Mr. A. Shalaby.
Exhibit No. 9P.	Section 10. - Mr. A. Hill.
Exhibit No. 10.	Report Titles "Nuclear Follies" by James Cook, presented by B. Snell, Consultant to the Committee.
Exhibit No. 11.	Transmission Lines of Quebec Purchase of Power, presented by Mr. T. Hill.
Exhibit No. 12.	Transmission Lines of Quebec Purchase of Power, presented by Mr. T. Hill.
Exhibit No. 13.	Presentation of Ontario Hydro Section 11, Mr. L. G. McConnell.
Exhibit No. 14.	World Energy Plan Beckett and Simpson Consultants.
Exhibit No. 14A.	Brief by Regional Municipality of Durham prepared by Mr. Gerry Herrama.
Exhibit No. 15.	Brief to Select Committee on Energy prepared by Mr. Bruce Taylor, Chairman of Darlington Energy Park Task Force.
Exhibit No. 16.	Presentation to the Committee by Ontario Hydro, Ms. Marie Hubbard, Regional Councillor Chairman.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 17.	Brief by Town of Newcastle Development Group presented by Richard James.
Exhibit No. 18.	Brief by the Continuation and completion of the Darlington Generating Station presented by Mayor G. Richard.
Exhibit No. 19.	Brief in support of preserving Darlington Nuclear Generating Station presented by Citizens for Darlington Nuclear Survival.
Exhibit No. 20.	Brief by United Brotherhood of Carpenters presented by Mr. Q. Bedd.
Exhibit No. 21.	Brief in support of preserving Darlington Nuclear, prepared by Mr. C. Carter.
Exhibit No. 22.	Brief on Darlington Nuclear Station presented by Mrs. P. Craig.
Exhibit No. 23.	Brief on Darlington Nuclear Station prepared by Ms. C. Reynolds.
Exhibit No. 24.	Brief on Darlington Generating Station prepared by Mr. H. Tensen.
Exhibit No. 25.	Brief by the Cobourg and District Labour Council presented by Mr. B. Burd.
Exhibit No. 26.	Brief by the Darlington Generating Station presented by Mr. William Wyatt.
Exhibit No. 27.	Brief on Darlington Nuclear Station presented by P. G. Lam.
Exhibit No. 28.	Darlington Generating Station James Slyfield.
Exhibit No. 29.	Brief on the Darlington Nuclear Energy Station presented by Mr. B. Shewchuk.
Exhibit No. 30.	Brief on the Future Energy Needs for Ontario presented D. Black on behalf of South Glenville High School (Prescott, Ontario).

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 31.	Newspaper Response Citizens for Darlington Nuclear Survival.
Exhibit No. 32.	Darlington Generation Station Mr. John S. Colven.
Exhibit No. 33.	Darlington Nuclear Generation Station Petition made by several people, presented by Town of Newcastle.
Exhibit No. 34.	Darlington Energy Park - Revised Draft Inducon Consultants presented by Town of Newcastle.
Exhibit No. 35.	Darlington Heat Utilization Study Inducon Consultants of Canada Ltd. Ernest and Whinney Congeneration Associated.
Exhibit No. 36.	Brief on Darlington Nuclear Station, by Cynthia Graig.
Exhibit No. 37.	Nuclear Engineering International presented by N. S. Wells and R. S. Hart.
Exhibit No. 38.	Brief by Allied Construction Trades Council Mr. A. Minsky, Councillor.
Exhibit No. 39.	Brief by Canadian Nuclear Society presented by Mr. J. Howieson.
Exhibit No. 40.	Brief by Atomic Energy of Canada Ltd. presented by Mr. J. Donnelly, President and Chief Executive Officer.
Exhibit No. 41.	Brief by Ontario Sheet Workers' Conference presented by Mr. G. Ward, Business Manager.
Exhibit No. 42.	Research paper entitled "Hydro Uranium Contracts" prepared by Mr. J. Richmond, Research Officer.
Exhibit No. 43.	Research paper entitled "Background Information on Quebec and Manitoba Hydro" prepared by Mr. J. Richmond, Research Officer.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 44.	Brief by Mr. Thomas Berry.
Exhibit No. 45.	Brief by International Brotherhood of Electrical Workers' Construction Council of Ontario, and the Electrical Power System Construction Council of Ontario presented by Mr. R. Tersigi, Executive Secretary-Treasurer.
Exhibit No. 46.	Brief by Mr. John W. Harding.
Exhibit No. 47.	Brief by The Ontario Pipe Trades Council, presented by Mr. T. Bryne Executive Secretary-Treasurer.
Exhibit No. 48.	Brief by C.U.P.E. Local 1000 Ontario Hydro Employees Union Presented by Mr. Jack MacDonald, President.
Exhibit No. 49.	Brief by Ontario Municipal Electric Association, presentd by Wm. C. Rowney, President.
Exhibit No. 50.	Brief by Town of Kincardine Industrial Committee presented by Mr. Glenn R. Sutton, P. Eng.
Exhibit No. 51.	Brief by Society of A.E.C.L. Professional Employees, presented by Dr. H. R. Andrews, and Mr. M. Harvey.
Exhibit No. 51B.	Addendum to Brief of A.E.C.L.
Exhibit No. 52.	Brief by Chalk River Technicians and Technologists, Local 1568, C.L.C. presented By Mr. Jack Shankula, President.
Exhibit No. 53A.	Brief by the Town of Deep River presented by Mayor Lyall Smith.
Exhibit No. 53B.	Accompanying Letters of Support for A.E.C.L./C.R.N.L.
Exhibit No. 53C.	Letter from Mayor L. Smith containing a list of suggested expert witnesses and a copy of Transcript of Cross examination of Mr. A. Lovins during Pennsylvania, Public Utility Commission hearings on the Economics of the Limerick Generating Station, Philadelphia, PA. March 30, 1981.
Exhibit No. 54.	Brief by Algoma Manitoulin Nuclear Awareness, Presented by Mr. G. Greenspoon, Member.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 55.	Letters from Mr. P.D. O'Brien.
Exhibit No. 56.	Copy of City of Toronto Resolutions Dated September 9, 1985, presented by the City Clerk.
Exhibit No. 57.	Research paper entitled Ontario Hydro, List of Major Studies since 1975 - prepared by Donald R. Krueger, Information and Reference Librarian, Ontario Legislative Library.
Exhibit No. 58.	Brief by the Joint Industry Task Force, presented by Mr. D. Armour, president of the Electrical and Electronic Manufacturers' Association of Canada.
Exhibit No. 59.	Brief by the Association of Major Power Consumers in Ontario presented by Mr. K. Kidd, Consulting Engineer for the Association.
Exhibit No. 60.	Brief by the Society of Ontario Hydro Professional and Administrative Employees, presented by Mr. C. M. Bailey, Vice-President F.E.S.A.
Exhibit No. 61.	Brief by the Society of Ontario Hydro Professional and Administrative Employees, presented by Mr. K. Johanson, Vice-President.
Exhibit No. 62.	Biographical Sketch of Armory B. Lovins and L. Hunter Lovins.
Exhibit No. 63.	Newsletter entitled State of the A.R.T. prepared by Nicholas Teekman.
Exhibit No. 64.	Brief of the Ministry of Treasury and Economics presented to the Committee.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 65.	Research paper entitled "Background notes on Expert Witnesses", prepared by David Neufeld and Jerry Richmond Research Officers.
Exhibit No. 66.	Research paper entitled "Least-Cost Electrical Services or an Alternative to the Braidwood Project" by Amory B. Lovins; a Summary, Prepared by Philip Kaye, Legislative Research Officer.
Exhibit No. 67.	Booklet entitled "The Road to Trillion Dollar Energy Savings" June 1984, presented by Public Citizen. (Given to the Committee by Mr. R. Nader).
Exhibit No. 68.	Article entitled "Hiding the True Costs of Energy Sources" by H. Richard Heede and Amory B. Lovins from The Wall Street Journal, Tuesday September 17, 1985, presented to the Committee by Mr. R. Nader.
Exhibit No. 69.	Newsletter entitled "Cub Notes" Vol. 1, No. 2, Winter 1985, presented to the Committee by Mr. R. Nader.
Exhibit No. 70.	Brief by Toronto Nuclear Awareness, presented by Mr. D. H. Martin.
Exhibit No. 71.	Pamphlet entitled "Think about Ontario Hydro Nuclear Power and Nuclear Weapons", presented to the Committee by D. Martin of Toronto Nuclear Awareness.
Exhibit No. 72.	Newspaper entitled "Nuclear Free Ontario", presented to the Committee by Mr. D. Martin of Toronto Nuclear Awareness.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 73.	Brief entitle Alternative Energy Sources/Paths submitted by Ralph D. Torrie.
Exhibit No. 74.	Brochure entitle "Galt Energy Systems Ltd" Economy through Innovations presented to the Committee by Mr. J. Passmore.
Exhibit No. 75.	Brochure entitle "Solar Energy" The New Horizon, presented to the Committee by Mr. J. Passmore.
Exhibit No. 76.	Brochure entitle "Solcan Ltd." presented to the Committee by Mr. J. Passmore.
Exhibit No. 77.	Brief by the Canadian Nuclear Association, presented by Mr. G. Warnock, Chairman.
Exhibit No. 78.	Direct testimony of Armory B. Lovins on behalf of the Badger Safe Energy Alliance Volume 33, presented by Mr. A. Lovins.
Exhibit No. 79.	Rocky Mountain Institute publication entitle "Scoping Calculation of Electrical Savings in a Pulp-and-Paper Mill" presented by Mr. A. Lovins.
Exhibit No. 80.	Memo from Mr. B. Snell, with background information on Hydro costs estimates.
Exhibit No. 81.	Memo from B. Snell with Background Information on Alternative Energy Sources.
Exhibit No. 82.	Statement by Mr. C. H. Dean, Jr., Chairman, Tennessee Valley Authority.
Exhibit No. 83.	Memo from B. Snell with Background Documentation on Economic Forecasts.
Exhibit No. 84.	Background material provided by Mr. S. levin, Ph.D. Commissioner, Illinois Commerce Commission.
Exhibit No. 85.A	Statement by Energy Probe, presented by Mr. L. Solomon.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 85.B	Addendum to Energy Probe statement entitle "United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR 1982) Estimates of Health Effects Applied to Canadian Nuclear Power.
Exhibit No. 85.C	Addendum to Energy Probe statement pamphlet from "Nucleus" - A Report to Union of Concerned Scientists Sponsors. Vol. 4, Number 4, Winter 1985 entitle "The Consequences of a Nucler Reactor Accident".
Exhibit No. 85.D	Addendum to Statement of Energy Probe Book entitle "Power at what Cost? Why Ontario Hydro is out of Control? What Needs to be Done About it." by L. Solomon.
Exhibit No. 85.E	Addendum to Energy Probe statement Article entitle, "Utility Fossil Fuel Electricity Generation and Emissions." by Province, 1980 and 1983.
Exhibit No. 86.	Brief from the Ministry of Energy by Mr. B. MacOdrum, Assistant Deputy Minister.
Exhibit No. 87.	Background Information provided by Mr. B. Snell, on "Cost Estimate of Delaying in Service of Darlington Units" and Long-Range Financial Projection 1985-2005 and 1985 Darlington Review.
Exhibit No. 88.	Presentation by T. J. Carter of Ontario Hydro on Radioactive Materials Management.
Exhibit No. 89.	Pamphlet entitle "Nuclear Fuel Waste Management Protecting the Future", presented by Atomic Energy of Canada Limited.
Exhibit No. 90.	Brochure entitle "Generating Capacity in U.S. Electric Utilities" "An update, Presented by Mr. T. Keelin, Principal, Strategic Decisions Group, Menlo Park, California.
Exhibit No. 91.A	Brief by Mr. M. Gent, President of the North American Electric Reliability Council.
Exhibit No. 91.B	Report entitle "1985 Reliability Review" A Review of Bulk Power System Reliability in North America, presented by Mr. M. Gent.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 91.C	Report entitle "1985 Electric Power Supply and Demand for 1985-1994" presented by Mr. M. Gent.
Exhibit No. 92.	Statement by Mr. C. Komanoff.
Exhibit No. 93A.	Statement by Mr. M. Nastich, President Ontario Hydro (Volume 2 - Sec. 13A).
Exhibit No. 93B.	Statement by Mr. L. G. McConnell, Vice-President Power System Program (Vol. 2 Sec. 13B).
Exhibit No. 93C.	Statement by Mr. A. Hill, Director of System Planning, Mr. R. W. Bartholomew, Vice-President, Finance. (Volume 2, Section 14).
Exhibit No. 93D.	Statement by Mr. S. G. Horton, Ontario Hydro and Mr. J. K. Snelson, Ontario Hydro. (Volume 2, Section 15).
Exhibit No. 93E.	Statement by Mr. L. G. McConnell, Vice-President Ontario Hydro, (Volume 2, Section 16A) entitle "Total Radiation Dosage, Ontario Hydro Nuclear Program Simplified Version."
Exhibit No. 93F.	Statement by Mr. L. G. McConnell, Vice-President Ontario Hydro, (Volume 2, Section 16A) Regular Version.
Exhibit No. 93G.	Statement by Mr. A. Niitemberg, Ontario Hydro, (Volume 2, Section 16C).
Exhibit No. 93H.	Statement by Mr. D. B. MacCarthy, Ontario Hydro, (Volume 2, Section 16B).
Exhibit No. 93I.	Statement by Mr. L. G. McConnell, Vice-President Power System Program, (Volume 2, Section 17).
Exhibit No. 93J.	Statement by Mr. T. Campbell, Chairman (Volume 2, Section 18).
Exhibit No. 94.	Response to questions passed by the Members of the Committee to Mr. P. C. Parshley, Vice-President, Taxable Fixed Income Division. Donaldson, Lufkin and Jenrette.

SELECT COMMITTEE ON ENERGY

EXHIBIT LIST (Continued)

ONTARIO HYDRO

Exhibit No. 95.	Research paper entitle "Energy Programs of France, Japan and Sweden" prepared for the Committee by Mr. D. Neufeld, Research Officer, Legislative Research Service.
Exhibit No. 96.	Articles from the Energy Daily, Volume 13, Number 178 dated Tuesday, September 17, 1985 presented to the Committee by Mr. B. Snell.
Exhibit No. 97.	A Graph entitle "Comparison of Natural Gas Price Forecasts - Fall 1985" presented by Mr. B. Snell.
Exhibit No. 98.	A Table entitle "Comparison of Energy Price Forecasts - September 1985" (Table A - October 4, 1985) presented by Mr. B. Snell.
Exhibit No. 99.	Submission from Project Ploughshares (Orillia) by Ms. J. Caldwell, Co-Chairperson and Mr. A. Thompson.
Ehibit No. 100.	A report entitle "Determining the Long-Term potential for Energy Conservation and Renewable Energy in Canada, by J. B. Robinson, D. B. Brooks, R. D. Torrie, H. Boerma, K. Brown, A. Gallant, J. Harrison, T. Hodge, Susan Holtz, Helene Lajambe, R. Lalonde, Jay Lewis, Yvonne Penning, Bonny Pond, Wm. Ross, and G. Stiles from Department of Man-Environment, University of Waterloo, presented by Mr. R. Torrie.
Exhibit No. 101.	Report entitle "A Soft Energy Path for Canada: Can it be made to work?" by the Friends of the Earth, Canada, presented by Mr. R. Torrie.
Exhibit No. 102.	Volume III A Soft Energy Path for Ontario, by Friends of the Earth, Canada presented by Mr. R. Torrie.
Exhibit No. 103.	Report: Governor's Task Force Report on Public Service Company of Indiana Marble Hill Station, presented by the Office of the Governor of Indiana.

Exhibit No. 104.	Statement by Mr. T. Burrell.
Exhibit No. 105.	Brief; Rebutal of Ontario Hydro entitle "The Cost in Human Life" presented by Mr. D. Poch, Energy Probe.
Exhibit No. 106.	Brief; Rebutal of Ontario Hydro, on presentation Volume 2, Section 15, presented by Mr. N. Rubin, Energy Probe.
Exhibit No. 107.	Statement by The Honourable Vincent G. Kerrio, M.P.P., Minister of Energy.
Exhibit No. 108.	Three page letter entitle "Toronto Hydro's plans to spend up to $1 billion in the 1980s to allow use of electric heat" and Brief entitle "Toronto Hydro - Residential Load Growth Study - July, 1983", prepared by Alderman Richard Gilbert.
Exhibit No. 109.	Research paper entitle "Electricity Management and Conservation Programs of Pacific Gas and Electric Company and Southern California Edison Company" prepared for the Committee by Mr. D. Neufeld, Research Officer, Legislative Research Service.
Exhibit No. 110.	Research paper entitle "Energy Conservation and Employment" prepared for the Committee by Mr. D. Neufeld, Research Officer, Legislative Research Service.
Exhibit No. 111.	Biographical Sketch of Amory B. Lovins and L. Hunter Lovins.
Exhibit No. 112.	Letter entitle "Future of Planned Darlington Nuclear Generating Station of Ontario Hydro" from Harold B. Stevens.

APPENDIX D

Assessing the Impact of Ontario Hydro's Plans On the Province's Financial Situation

ASSESSING THE IMPACT OF HYDRO'S PLANS ON THE PROVINCE'S FINANCIAL SITUATION

In July 1985, the credit rating of the Ontario government was placed on "credit watch" by a U.S. credit rating agency and on November 12, 1985, the credit rating was lowered from triple-A to double-A plus. Given the importance of the credit rating to the government's financial operations, the Committee decided to investigate possible impacts of Hydro's plans, including the impact of financing Darlington, on the province's credit rating. A second issue reviewed by the Committee is related to the concern that large borrowings on behalf of Hydro "crowds out" the spending on alternative government programs. Both of these issues are discussed in this Appendix.

A. Ontario Hydro is a self-supporting utility and does not affect the province's credit rating.

Evidence presented to the Committee suggests that the activities of Ontario Hydro have not, and currently do not, affect the province's credit rating in a negative manner. The evidence presented can be summarized as follows:

1. Ontario Hydro is a self-supporting utility, in that its debt is paid through its operating surplus, not by the government. The government's role as a guarantor is outlined in Schedule 1 of this Appendix.

2. Ontario Hydro has made significant positive contributions to the province's economic health through the provision of low electricity rates and investment in the province.

3. Ontario Hydro's operating surplus has averaged 10.8% over the past ten years. Current financial ratios (debt/equity interest coverage and cash flow coverage) demonstrate financial stability and projected ratios indicate even better performance (see Charts I-VI).

4. Ontario Hydro has had adequate and regular rate increases to cover cost increases and ensure an operating surplus. There is no reason to believe that the process of rate review and approval won't continue in this manner.

5. Documents received from a major U.S. credit rating agency give a positive review of Ontario Hydro and indicate that the recent credit downgrading being placed on Ontario is due to its fiscal situation, quite separate from the activities of Ontario Hydro (Schedule 2 and Schedule 3).

B. Ontario Hydro's borrowing schedule does not restrict the government's financial options.

The borrowing done by the province on behalf of Ontario Hydro is taken from the province's overall debt capacity. Therefore, Ontario Hydro could constrain the level of financing available to the province if the borrowing of both parties exceeded the borrowing capacity of Ontario credit. However, Ontario Hydro's borrowing requirements have been declining and over the period from 1986 through 1992, they will be lower than the past decade (Charts VII, VII). Chart IX shows Ontario Hydro's requirements and estimates by the Ministry of Treasury and Economics of Ontario's borrowing capacity. This chart demonstrates that Ontario Hydro is projected to use a moderate and declining portion of public market borrowing capacity in the period in which Darlington is scheduled to be completed.

The combined borrowing requirements of Ontario Hydro and the province have exceeded the province's credit capacity only once in the recent past. It is the Committee's understanding that on this occasion it was Ontario Hydro's borrowing, and not the provincial deficit, which was curtailed.

In summary, the evidence suggests that the Darlington project would not alter Ontario Hydro's status as a self-supporting utility:

- financial performance measures are projected to improve through the time of construction and in-service dates;
- rate increases are expected to be at or below inflation through this period; and
- capital spending and borrowing is expected to decline.

Officials from the Ministry of Treasury and Economics stated that if all or part of Darlington was cancelled for reasons other than economic considerations, then it is possible that there would be a negative impact on the province's credit rating. Since credit rating agencies are concerned only with matters related to an organization's ability to pay back its debt, a decision to choose an alternative that was less economically desirable could jeopardize the rating. The credit agencies would re-evaluate Hydro's ability to meet its debt payments, consider the large assets sitting idle, and estimate the implications of possible rate increases and the effect on the provincial fiscal situation.

DEBT/EQUITY RATIO

CHART I
Historical

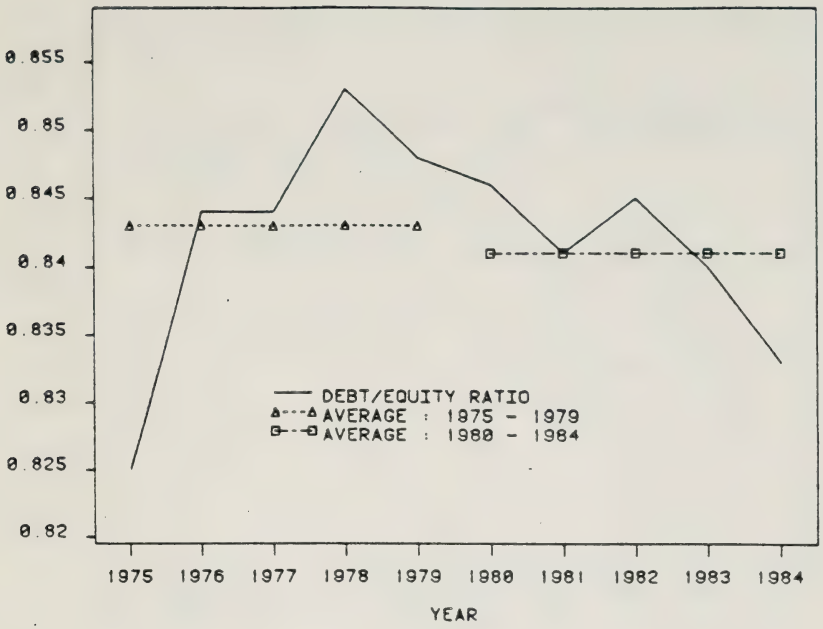
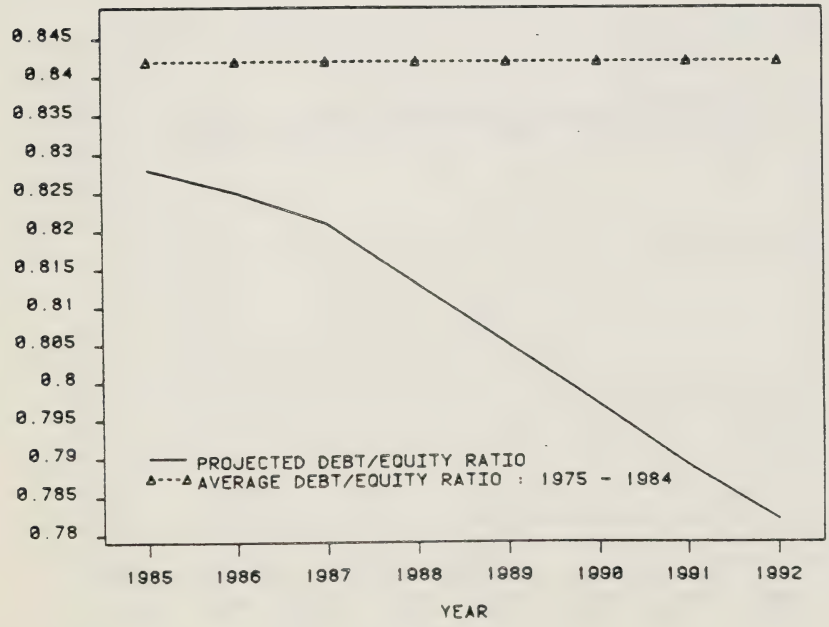


CHART II
Projected



Source: Ministry of Treasury and Economics

INTEREST COVERAGE RATIO

CHART III
Historical

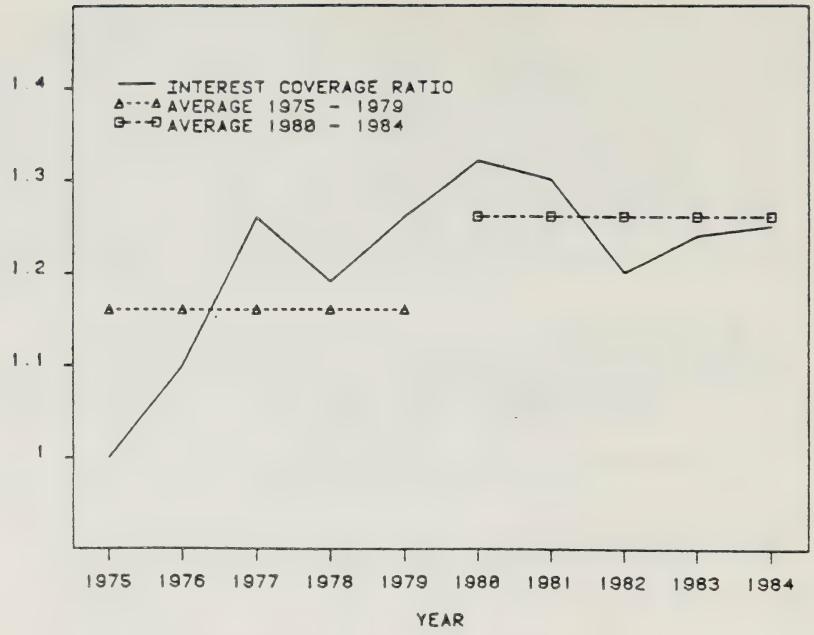
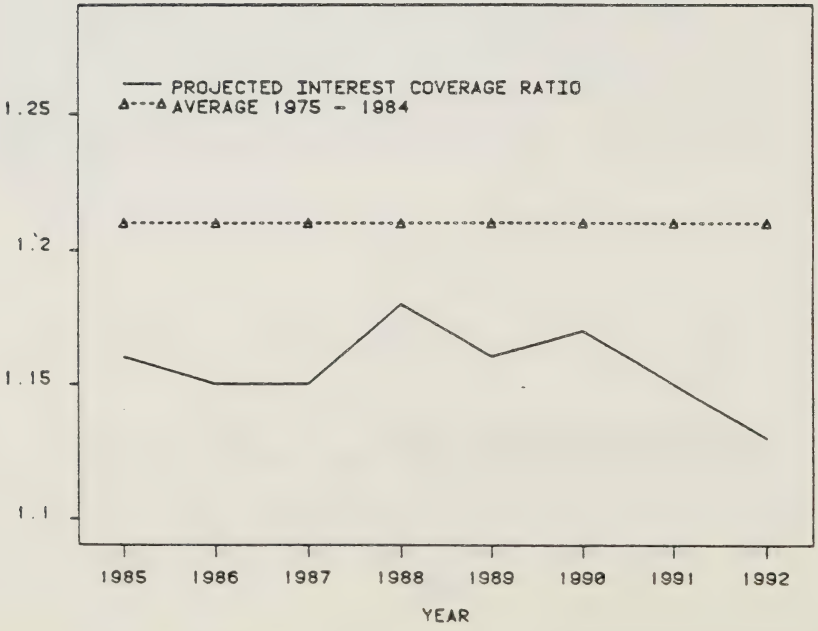


CHART IV
Projected



Source: Ministry of Treasury and Economics

CASH FLOW COVERAGE

CHART V
Historical

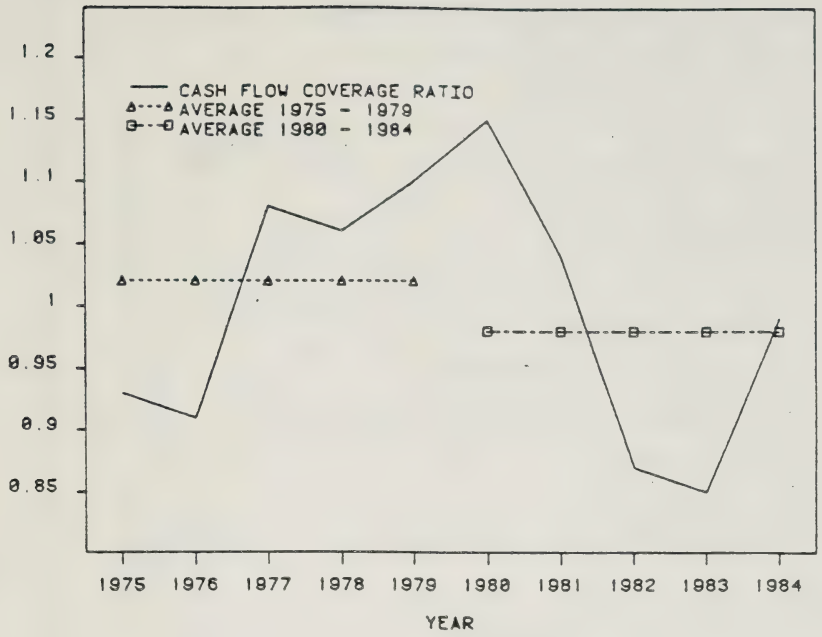
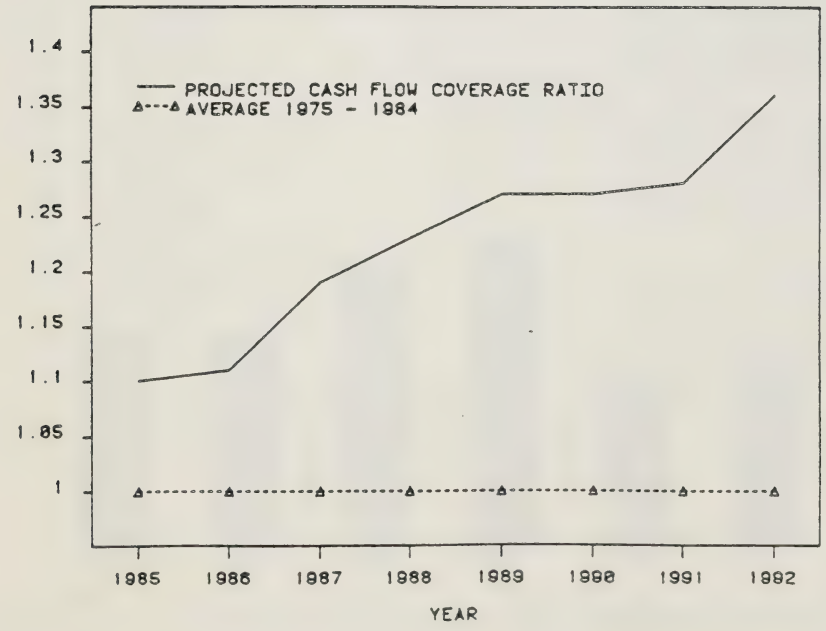


CHART VI
Projected



Source: Ministry of Treasury and Economics

CHART VII
Ontario Hydro Borrowing
1985 $Billions

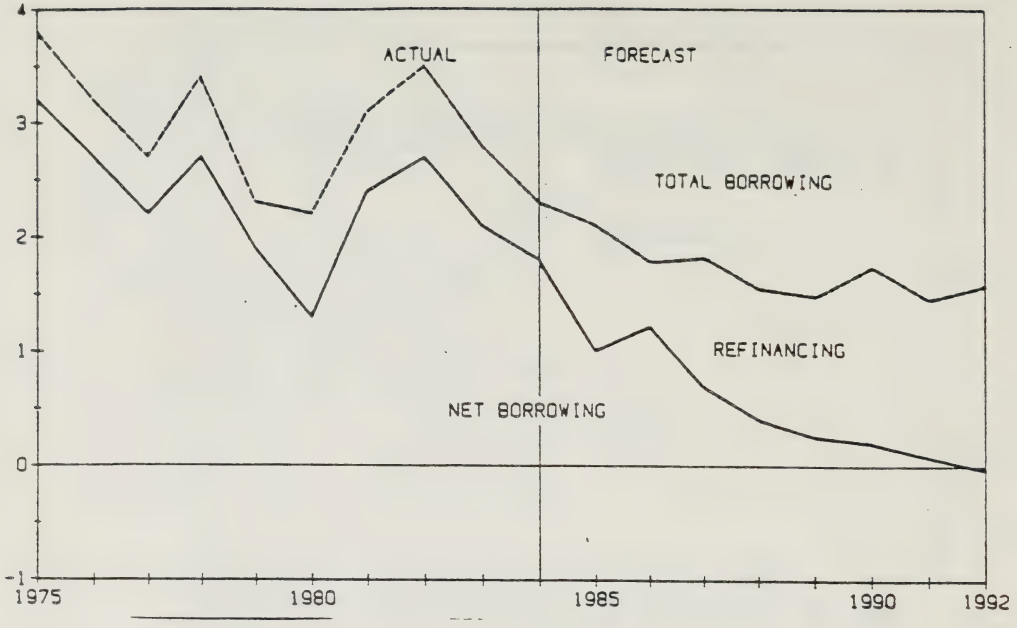
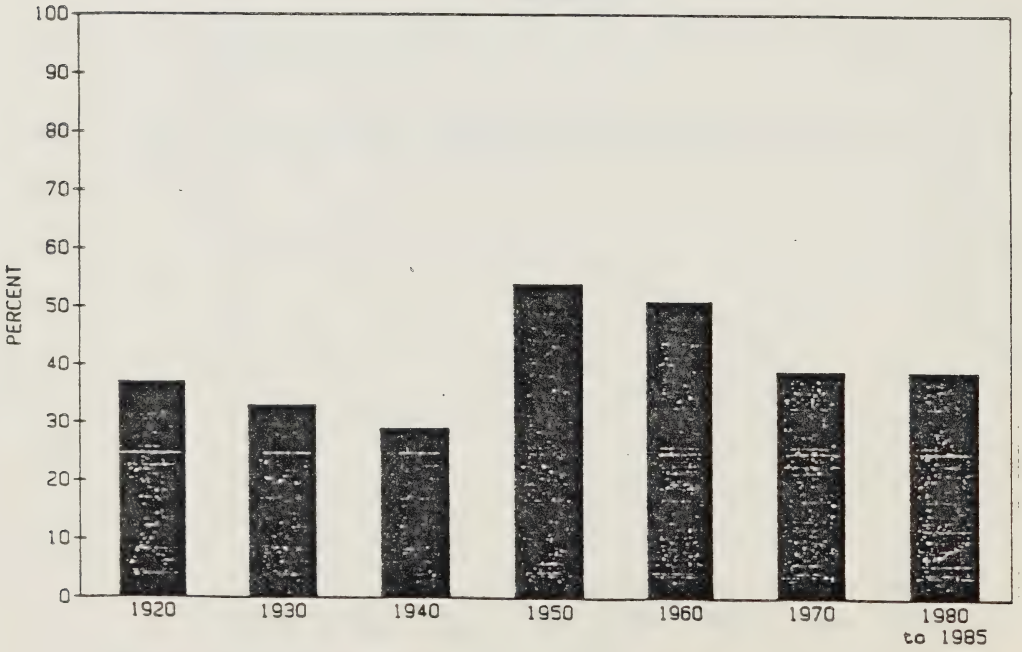


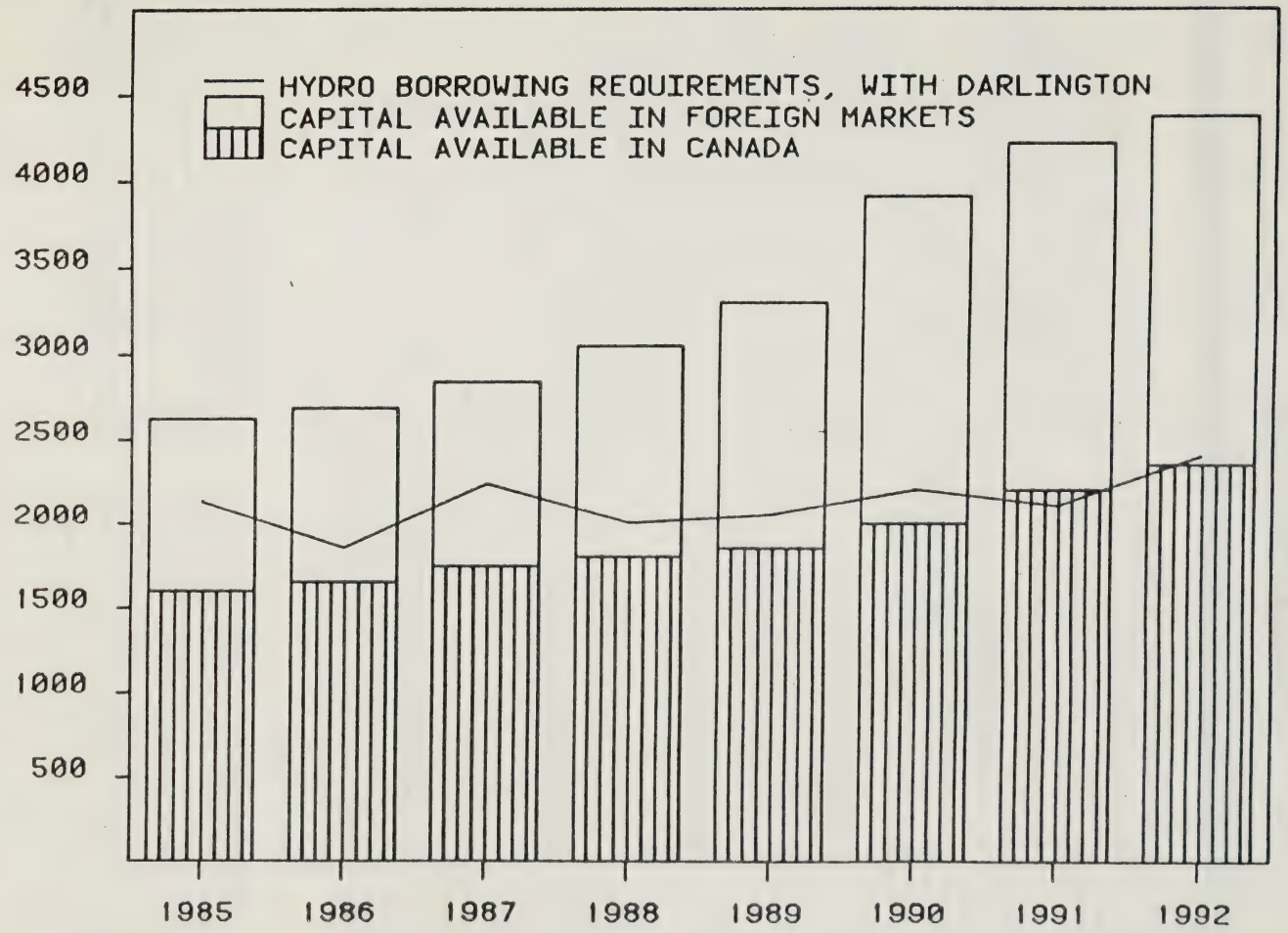
CHART VIII
Ontario Hydro Debt as a Percent of Total Ontario Debt



Source: Ministry of Treasury and Economics

CHART IX

HYDRO REQUIREMENTS AND BORROWING CAPACITY
1985 to 1992



Source: Ministry of Treasury and Economics

CreditComment

Canadian electric utilities

Provincial governments provide the ultimate credit support for the electric utilities in Canada whose debt S&P rates. In each of these provinces, the government owns the utility and guarantees its debt. As a result, the province essentially determines the utility's creditworthiness even on a stand-alone basis. Public policy objectives override constraints that financial markets would impose in the absence of guarantees.

A utility's need for this credit support, and its contribution to provincial objectives, determine its impact on the province's creditworthiness. Each utility represents a significant contingent liability for its provincial owner. The likelihood that guarantees will be drawn upon depends on the regulatory environment, the utility's financial performance, and its operating risks. The utility's contribution to the province depends largely on the importance of inexpensive, reliable electricity and the utility's capital spending to the local economy.

Although there are significant differences in the creditworthiness of provincial utilities on a stand-alone basis, each needs the credit support of its provincial owner. The financial performance of Canadian electric utilities is below the average for their investor-owned counterparts in the U.S. However, this relatively weak financial performance is explained by the utilities' ownership and role in provincial economic development.

Background

All Canadian provinces except Alberta own and operate electric utilities. Of the nine, S&P rates all but one, Prince Edward Island. Economically and financially, these utilities are extremely important to the provinces. While each utility is a crown corporation, the degree of government involvement in the utility varies. In general, the province appoints members of the board of directors, but is not involved in daily operations. Rates are usually set with the explicit or implicit approval of an individual minister or the provincial cabinet. In some cases, such as Newfoundland, Ontario, and British Columbia, rate hearings are held before a provincial energy utilities board prior to governmental approval. The government may also approve such activities as capital programs. In Ontario and Saskatchewan, the province issues and guarantees the utility's foreign debt. In every province the utility supplies, in wholesale or retail form, virtually all the electric power in the province.

Regulatory environment

The financial performance of a provincially owned utility is largely determined by government policy. Any utility is financially constrained by the attitude of regulatory authorities toward such public issues as rate increases, safety, and the environment. However, if a government owns a utility and guarantees its debt, regulatory authorities are not as directly affected by constraints that financial markets impose. Rates of return need not be high to attract equity from private sources. Protection for investors in guaranteed bonds is less dependent on the degree of leverage at the utility itself. As a result, these utilities can be regulated to meet economic policy objectives with much less emphasis upon external financial constraints.

In Canada, regulatory authorities generally keep electricity rates low to promote economic development. Statutory requirements concerning rates of return, fixed charge coverage, and debt leverage are regarded almost as ceilings on financial performance, not simply as floors. The financial performance of Canadian utilities reflects this regulatory environment.

Financial performance

The financial performance of provincial utilities is generally below the average for investor-owned utilities in the United States. Low electricity rates limit earnings available for debt service and reserves. In a worst-case scenario, provincial guarantees rather than the financial resources of the utilities themselves ensure continued debt service.

—*Earnings protection.* Provincial utilities generally earn less than their investor-owned counterparts. For example, Hydro-Quebec's electricity rates are roughly one-quarter those in New York City because the province takes maximum advantage of Hydro's low-cost structure to attract new businesses. As a result, Hydro-Quebec's return on assets is below that earned by most private sector utilities. Similarly, rate freezes in Manitoba and Nova Scotia have depressed earnings recently. The chart below shows that low electricity rates throughout Canada have resulted in fixed charge coverages below S&P's targets for investment-grade, investor-owned utilities.

Interest coverage (x)	1983	1982	1981	1980	1979
		— Year end Dec. 31 —			
B.C. Hydro*	1.16	1.51	1.28	1.25	1.17
Sask. Power	—	0.98	1.00	1.23	1.51
Man. Hydro*	0.93	0.91	0.93	1.21	1.20
Ont. Hydro	—	1.20	1.30	1.32	1.26
Hydro-Quebec	—	1.42	1.33	1.55	1.67
Nfld. & Lab. Hydro	—	1.19	1.23	1.23	1.17
NB Elec. Power*	1.09	1.31	1.22	1.28	—
NS Power*	0.99	0.84	0.99	1.10	1.03

*As of Mar. 31

	AAA	AA	A	BBB
Targets for investor-owned utilities	4.0+	3.25–4.25	2.5–3.5	2.0–3.0

—*Leverage.* No Canadian utility meets S&P's leverage target for investment-grade, investor-owned utilities. Provincial governments have not tied up public funds in equity except when necessary to meet statutory requirements. Low electricity rates have also limited the size of retained earnings. Manitoba Hydro had to draw down reserves to cover losses associated with the rate freeze. Nova Scotia Power has experienced two years of negative earnings despite provincial subsidies. The leverage chart on the next page shows debt as a proportion of permanent capital, including the capitalized value of leases in both debt and permanent capital.

Leverage (%)	1983	1982	1981	1980	1979
	—Fiscal year end Dec. 31—				
B.C. Hydro*	92.5	92.0	93.7	95.3	94.8
Sask. Power	—	86.6	84.1	81.9	82.1
Man. Hydro*	97.6	96.9	96.0	95.5	96.9
Ont. Hydro	—	85.1	84.7	85.4	85.6
Hydro-Quebec	—	75.1	75.8	75.8	76.7
Nfld. & Lab. Hydro	—	85.2	85.5	86.6	94.3
NB Elec. Power*	92.7	91.9	92.0	93.6	—
NS Power*	97.5	97.0	95.4	98.2	99.0
*As of Mar. 31					

	AAA	AA	A	BBB
Targets for investor-owned utilities	45	42-47	45-55	53

Cash flow adequacy (%)	1983	1982	1981	1980	1979
	—Year end Dec. 31—				
B.C. Hydro*	24.2	41.0	41.5	23.0	20.5
Sask. Power	—	44.4	38.7	59.8	84.7
Man. Hydro*	175.3	113.8	130.8	115.5	50.2
Ont. Hydro	—	19.5	34.0	47.8	24.8
Hydro-Quebec	—	49.3	27.0	33.7	20.5
Nfld. & Lab. Hydro	—	58.5	83.9	216.5	82.5
NB Elec. Power*	46.2	70.8	5.5	8.9	—
NS Power*	24.8	52.0	166.1	43.4	20.0
*As of Mar. 31					

	AAA	AA	A	BBB
Targets for investor-owned utilities	—	40%	30-50%	<30%

—*Cash flow adequacy.* Cash flow available for capital spending varies considerably among the Canadian utilities. The chart (*top right column*) shows cash flow relative to capital requirements, excluding capitalized interest from both earnings and investment. Manitoba Hydro's cash flow ratios exceed S&P's target for 'AAA' investor-owned utilities because its capital spending is relatively low. Ontario Hydro and Hydro-Quebec have the greatest capital requirements, spending over C$2.5 billion per year in gross additions to utility plant. Hydro-Quebec's capital spending will level off, however, as the James Bay project is completed.

—*Financial flexibility.* Canadian utilities' access to financial markets follows that of their provincial owners. Each of the utilities coordinates its own borrowings with those of the province. For example, the province of Quebec did not borrow in the U.S. for several years, leaving that market to Hydro-Quebec. The province of Ontario has also reserved the U.S. market for utility financing since the mid-1970s. Most provincial utilities have increased their financial flexibility by borrowing in markets outside Canada and the U.S.

—*Accounting quality.* The Canadian utilities follow generally accepted accounting principles in the U.S. with one notable exception. They value foreign debt at exchange rates at the time of issue, not the balance sheet date. Although export earnings can offset foreign exchange risk, exchange fluctuations can have a significant impact on sizable U.S. dollar-denominated liabilities. For example, Hydro-Quebec reports in a note to its financial statements that its C$16 billion in debt would be $1 billion higher if foreign debt (two-thirds of total debt) were reported at exchange rates prevailing at the balance sheet debt of Dec. 31, 1983. All of the Canadian utilities now include such a note in financial statements.

The provincial utilities also follow different accounting policies concerning costs associated with deferred projects. For example, both British Columbia Hydro and Ontario Hydro have indefinitely deferred projects because of reduced load forecasts. However, British Columbia Hydro took the write-off as an extraordinary item in fiscal 1983, whereas Ontario Hydro is amortizing the costs over a 10-year period.

Operations

A provincial utility's operating risk is largely determined by the economic position of the province itself. Provincial economic trends largely determine the staying power of market demand. Canadian utilities are highly efficient and have virtual monopolies in their markets, so competitive pressures are limited. Similarly, exposure to fuel or supply disruptions depends almost entirely on the province's own hydroelectric and coal resources.

—*Market or service territory.* In Canada, the province is the utility's primary market, so market risk amounts to provincial economic risk. Load growth follows economic growth, given price and income elasticity of demand for electricity. Similarly, the potential for sudden excess capacity or shortages depends on the degree of economic volatility in the province. For example, load growth was significant in British Columbia throughout the 1970s but dropped sharply during the latest recession. Revised load growth projections indicated significant excess capacity, which B.C. Hydro reduced through the cancelation of some small projects and the sale of excess power to California. The table below shows that several provincial utilities have significant excess capacity. However given their ability to compete favorably for power sales in the U.S., no Canadian utility's performance has been greatly affected.

—*Operating efficiency.* Provincial utilities are relatively immune from the competitive risks associated with problems in the cost or quality of service for two reasons. First, costs are low and quality is high. The provincial utilities rely largely on inexpensive, reliable hydroelectric power. As a result, operating costs are generally lower than those associated with thermal plants. Only Ontario Hydro and New Brunswick Electric Power are subject to the risks associated with nuclear plants. Construction of New Brunswick's nuclear plant, which was commissioned last year, entailed significant cost overruns. However, both New Brunswick and Ontario operate CANDU nuclear plants which have experienced fewer post-completion problems than most systems in the world.

Second, no provincial utility is subject to significant competitive risks. Alternative sources of power, such as gas or solar

Operating statistics†

	B.C.	Sask.	Man.	Ont.	Que.	Nfld.	New Brunswick	Nova Scotia
Gen. capacity (mw)	8,832	2,262	3,926	24,906	19,142**	6,755	3,137	1,894
% Hydro	84.8	25.0	89.3	33.1	94.5	90.7	86.1	18.9
% Thermal	15.2	15.0	10.7	33.4	5.5	9.3	53.6	81.1
% Nuclear	0	0	0	33.4	0	0	20.2	0
Peak demand/capacity (%)	62.4	85.1	64.8	67.7	96.0**	97.2	51.5	58.9
Cost/kwh (¢) (excl. interest)	2.33	5.37	1.05	2.17	1.31	0.36	3.48	4.79
Export revenues/total revenues (%)	8.3	—	25.4	14.1	18.3	50.0*	33.5	25.3

*Newfoundland and Labrador Hydro's exports include those of Churchill Falls to Quebec.
**Excludes power purchased from Churchill Falls, currently 4,300mw.
†Statistics as of most recent fiscal year end.

(continued on next page)

Relative debt statistics

	B.C.	Sask.	Man.	Ont.	Que.	Nfld.	New Brunswick	Nova Scotia
Utility debt/Pt (%)	16.7	10.6	18.7	11.7	20.1	29.2	28.8	9.8
Utility debt/Prov debt	8.0	4.8	1.3	.9	1.2	.6	1.2	.3
Utility int. charges/prov. revenues								
Gross interest (%)	11.7	7.0	12.7	9.5	10.4	8.5	12.5	5.4
Net interest (%)	8.6	5.9	16.4	5.3	5.9	7.1	6.2	4.8

*Net interest excludes capitalized interest

energy, have not undermined electricity sales. The municipal utilities which operate in most provinces do not compete with provincial utilities for customers. Industrial companies which generate their own power, such as Alcan in British Columbia, usually sign agreements with the provincial utilities concerning power exchanges. Only export sales are subject to significant competition. The table on the prior page shows that exports are significant for almost all the provincial utilities. However, Canadian costs are so low that political considerations in the states purchasing the electricity have been more important than price. For example, Quebec and Ontario can produce electricity at one-quarter the cost of New England utilities. American consumers are also intensifying their demands for lower electricity rates, offsetting other political pressures. As a result, transmission capabilities are becoming the only significant constraint on Canadian exports to the U.S. Several Canadian utilities are now building new transmission lines.

—*Fuel/power supply.* The province's own resource base largely determines the exposure of Canadian utilities to fuel or power supply risks. The availability of water represents the greatest risk. Manitoba Hydro's financial performance deteriorated in fiscal 1982 because of low water flow conditions. By comparison, the James Bay project has shielded Hydro-Quebec from almost any rainfall shortage. The possible failure of nuclear generating units represents a significant risk only for Ontario Hydro. However, the recent problems at Ontario Hydro's Pickering unit are the first significant ones in 20 years of operation. Ontario Hydro's exposure to fuel shortages is minimal given large stockpiles of uranium and sufficient production within the province to meet the utility's needs. In New Brunswick, the Point Lepreau nuclear facility represents only 20% of capacity, while total generating capacity was 50% greater than peak demand last year. Finally, none of the Canadian utilities is subject to significant oil price risks. Canada's large domestic oil resources allow the federal government to control oil prices.

Impact on provincial ratings

In evaluating the net impact of the utilities on provincial ratings, S&P balances the benefits which the utilities represent against the contingent liabilities which they represent. On a stand-alone basis, the best of the provincial utilities would likely achieve a low investment grade rating. Their guaranteed debt ratings are much higher, ranging from the 'AAA' on debt issued by Ontario Hydro to 'A' on debt issued by the provincial utilities in Nova Scotia and Newfoundland.

Utilities represent significant contingent liabilities for their provincial guarantors. The amount of utility debt outstanding is large, in absolute terms and relative to the provincial government's own debt. Hydro-Quebec and Ontario Hydro have by far the most debt, with C$15.6 billion and C$14.4 billion of long-term debt respectively. In other provinces, utility debt is often larger in comparison with the size of the provincial economy. Utility debt ranges from a high of 29.2% of personal income in Newfoundland to a low of 9.8% in Nova Scotia. Also, according to the table, utility debt charges would amount to a significant portion of provincial revenues should the provinces be called to honor their guarantees.

While the amount of the provincially supported debt determines the level of the contingent liability, the inherent strength of the utility determines the likelihood that this contingency will be drawn upon. The strength of the individual utilities varies considerably. High leverage, low interest coverage ratios, the need for ongoing operating subsidies, or a large construction program can increase the risk associated with a particular utility. When the potential need for a utility to draw upon the guarantee rises, the result is downward pressure on the province's own rating.

On the other hand, S&P recognizes that the utilities' financial performance is weak because of economic benefits they provide. The availability of reliable electric power at rates a fraction of those prevailing in the U.S. contributes to economic development. For example, Hydro-Quebec recently attracted two new aluminum plants by offering low electricity rates. These low electricity rates are also important in determining the overall energy consumption level and mix. Finally, these low rates allow the utilities to increase their export sales and thus bring new funds into the provincial economy. B.C. Hydro successfully negotiated sales contracts with California last month, while Ontario Hydro and Hydro-Quebec compete for customers in the Northeast and Midwest.

Capital expenditures by the utilities also represent a large proportion of total investment in the province. For example, Hydro-Quebec's $2.5 billion in capital spending during 1982 was more than double that of the provincial government, and amounted to 14% of total investment in the province. These investment projects, together with direct utility employment, provide many jobs in the province. Even with the prospect of reduced capital expenditures by many of the utilities, the infrastructure is now in place to accomodate economic development well into the future.

These positive factors contribute to the provincial rating. It is clear, however, that the degree of contribution varies greatly from province to province, with some such as Hydro Quebec, Ontario Hydro, and B.C. Hydro providing particularly strong support from an economic standpoint. These benefits must be weighed against the contingent liability created by the utility, which also ranges in magnitude, in assessing the overall impact of the utility on the province's debt rating. The financial performance of Hydro Quebec is clearly superior to the others in this respect but does not rank with that of highly rated, investor-owned utilities in the U.S. Consequently, while each utility contributes to the economic development and ultimate creditworthiness of its provincial owner, in every case the utility's debt rating is higher than it would be without the provincial guarantee.

Mary L. Conway, William J. Chambers

SCHEDULE 2

STANDARD & POOR'S **International** THIRD QUARTER 1984

CreditWeek

Ontario (Province)
Ontario Hydro

Reviewed: ratings affirmed

Rationale: S&P affirms its 'AAA' ratings on long-term debt issued or guaranteed by the Province of Ontario. The ratings are based on the strength of the province's continuing economic recovery from the 1982 recession, its low financing requirements relative to the provincial economy, and its relatively stable debt levels. After a severe economic downturn in 1982, the Ontario economy rebounded in 1983 and is expected to lead the provinces in real growth in 1984. Manufacturing and, in particular, automotive products have led the recovery and have recently led a resurgence in business investment plans. Despite the improved economic performance, budgetary deficits have been slow to decline. The fiscal 1985 budget projects a third year of operating deficits and a budgetary deficit exceeding 12% of revenues. However, stronger than expected economic growth appears likely to result in a lower budget deficit this year, and further improvements in fiscal 1986 are anticipated. Improved budgetary results in fiscal 1985 and 1986 are expected to reduce the debt burden. Net interest payments have risen as a percentage of budgetary revenues from 7.0% in 1981 to a projected 10.9% in fiscal 1985. The province continues to have considerable budgetary flexibility, particularly on the revenue side.

Economy: Ontario has a diversified economy in which manufacturing contributes more than a quarter of real output. Relative to most other provinces, Ontario has a smaller direct dependence on the primary sector. The community, business, and personal service sector is the largest source of employment.

Growth in real output was 3.9% in 1983 and is expected to be 4.8% in 1984. After the severe downturn in 1982, the recovery was led by the manufacturing and trade sectors with 5% and 7% increases, respectively. Within manufacturing, transportation equipment was the leader with an 18% increase in real output. About 80% of Canada's transportation equipment industry is in Ontario. Motor vehicles and parts accounted for 42% of Ontario's 1983 exports. Much of the expected improvement in the Ontario economy in 1984 will be related to export growth, particularly to the U.S.

Another source of strength was residential construction. Housing starts rose 43% to 55,000 in 1983. Nonresidential investment remained weak, falling for the second year in a row. However, in the past few months, major investments in the auto industry totaling more than C$2 billion through 1989 have been announced.

Ontario is expecting a 3.1% increase in employment in 1984, after a 0.7% increase in 1983 and a 2.5% decline in 1982. Yet, at 4.2 billion, 1984 employment (on a yearly average basis) will be only slightly above the pre-recession 1981 level. Participation rates have edged downward from a high of 67.6% in 1981 to 67.2% in 1983, but they are expected to rise slightly this year. The unemployment rate jumped from less than 7% in 1981 to 10.4% in 1983 but remained below the Canadian average. The unemployment rate is expected to fall to 9.1% in 1984 which is a much greater improvement than is projected for Canada as a whole.

Financial performance: Ontario recorded an operating deficit of C$1.2 billion in 1984 and a budgetary deficit before debt retirement of C$3.2 billion. In both cases the deficits were higher than in 1983 in absolute terms, but lower as a percentage of budgetary revenues. Improvements in both balances are projected for 1985. The 1985 budget still includes an operating deficit of C$746 million, but continued strong economic growth may result in further improvement this year. The slow pace of deficit reduction reflects government concern that rapid budgetary adjustment might endanger the economic recovery.

Budgetary revenues increased 10.3% or almost C$2 billion in 1984. Of the increase in revenues, 40% was from Federal transfers which grew largely as the result of revisions to gross national product and population that increased Ontario's payment under Established Programs Financing. While expenditure growth fell from double digit rates in 1982 and 1983 to 9.1% in 1984, expenditures still increased by a little over C$2 billion, resulting in a larger budgetary deficit. Virtually all of the expenditure growth was on the operating side. Capital expenditures remained at a little over $2 billion.

Own source revenues grew 7.4% in fiscal 1984 after a 9.6% increase in 1983. Within the own source category, only personal income tax receipts were weak, increasing by just 2.3% in 1984. The budget calls for a 16% increase in personal income tax receipts in 1985 which reflects several factors including the 18 month, 5% surtax that will generate more revenue in fiscal 1985 than it did in fiscal 1984. Federal transfers are expected to increase only 2% this year. The province continues to have substantial flexibility on the revenue side.

Ontario's nonbudgetary accounts include transactions related to its lending and investment activities, as well as certain trust funds it administers. The nonbudgetary account has recorded large surpluses in the last two years, and in 1984 it resulted in lower reported net cash requirements despite the increase in the budgetary deficit. Net inflows to the pension funds and the Ontario Savings Office are, however, more properly treated as a source of borrowing because these trust funds have obligations that are distinct from general provincial responsibilities. Thus, while such a source of funds provides additional flexibility, the obligations incurred must also be noted as unfunded debt and added to the funded debt of the province. The province pays interest on the trust fund borrowings at market rates, but the principal is not amortized.

Ontario's direct debt, excluding Ontario Hydro, has risen in absolute terms in recent years to C$27.5 billion on Mar. 31, 1984. As a percentage of personal income, however, direct debt fell in 1981 and 1982 and has since edged upward but is still below its 1980 level (*see table on page 13*). Guaranteed debt has increased a bit faster. At year-end 1984, net public sector debt was over 40% of personal income. In addition, the province is responsible for the unfunded liabilities of two public sector pension plans. The unfunded liabilities amounted to approximately C$550 million when the last actuarial studies were done in the early eighties. The province contributes annually to amortize the unfunded liabilities over a 15-year period.

The budgetary stress in Ontario has not been felt as much in the level of debt as in the increasing burden of interest payments. As a percentage of budgetary revenues they have increased almost steadily from 9.9% in 1980 to 11.9% in 1984 and are projected to reach 12.6% in 1985. On a net basis, the rise has been even greater, from 6.7% in 1980 to 10.0% in 1984 and 10.9% in 1985.

At March 31, 1984 exchange rates, guaranteed debt plus debt issued by the province on behalf of Ontario Hydro amounted to just over C$20 billion. Most of the province's guaranteed debt was issued by Ontario Hydro. On Dec. 31, 1983, Ontario Hydro's total debt was 84.5% of permanent capital, a slight improvement from year-end 1982. The utility's capital program, which is over C$3 billion this year, will decline to about C$2.5 billion annually over 1985–1987 and is devoted largely to nuclear generation. Ontario Hydro's net income rose 35% to C$472 million in 1983, as power rates increased and the recovery led to increased domestic demand and higher export sales.

Marie Cavanaugh

SCHEDULE 3

Ontario on S&P's Creditwatch, Negative

FOR IMMEDIATE RELEASE - July 12, 1985

New York -- S&P places the 'AAA' rated senior debt of the Province of Ontario and guaranteed obligations of Ontario Hydro on Creditwatch with negative implications. The actions are based on the projected deterioration in financial performance and uncertainty over the new government's objectives. About C$10.9 billion of debt is affected. The government of Ontario, in its recent Economic Statement, indicated that the province's net cash requirement in the current fiscal year, ending Mar. 31, 1986, will be C$2.2 billion, C$500 million higher than its net cash requirement last year. This projection is based on no change to existing expenditure programs and tax policy. The announced rise in net cash requirements reverses a trend of gradually improving budgetary performance since a deep recession in fiscal year 1982-83. The large increase indicated for this year is of particular concern because it occurs in a year when economic performance is projected to be quite strong. This has negative implications for the province's credit ratings, as it suggest the potential of continuing large borrowing requirements. The Economic Statement is one of the first pronouncements of the new government. While Treasuer Robert Nixon mentioned several new expenditure programs and some offsetting cost cutting measures, the financial implications of these initiatives were not provided. In addition, no mention was made of new revenue raising efforts. Consequently, the willingness of the new government to address the projected financial imbalance will apparently not become clear until the government presents its first budget sometime this fall.

For information, please contact Marie Cavanaugh at (212) 208-1555.

APPENDIX E

Detailed Costs of Alternatives

SCHEDULE 1

ONTARIO HYDRO ANALYSIS OF ALTERNATIVES

Most Probable Load Growth Scenario

	Build On Schedule	Cancel Units #3 & #4	Cancel All Units
Darlington Costs			
. Project	2,802	1,889	917
. Fuel	1,531	835	-
. OM&A	1,543	1,195	-
Total	5,876	3,919	917
Coal Substitute			
. Project	-	734	1,637
. Fuel	-	1,660	3,726
. OM&A	-	367	807
Total	-	2,761	6,170
Replacement Fuel	-	1,062	2,601
Net Export Revenue Lost	-	195	520
Other Costs	-	644	620
Total	5,876	8,581	11,108
NPV Benefit (Loss) From Base Case	0	(2,705)	(5,232)

SCHEDULE 2

ONTARIO HYDRO ANALYSIS OF ALTERNATIVES

Low Load Growth Scenario

	Build On Schedule	Cancel Units #3 & #4	Cancel All Units
Darlington Costs			
. Project	3,588	2,629	1,596
. Fuel	1,234	733	-
. OM&A	1,542	1,162	-
Total	6,364	4,525	1,596
Coal Substitute	-	-	-
Replacement Fuel	-	2,005	4,985
Net Export Revenue Lost	-	421	970
Other Costs	-	391	1,128
Total	6,364	7,342	8,679
NPV Benefit (Loss) From Base Case	-	(978)	(2,315)

APPENDIX F

Sensitivity Analysis

EXHIBIT F-1

DARLINGTON PROJECT COST ESTIMATE

	($ millions, current $)			INCREMENTAL COSTS FOR EACH ALTERNATIVE		
	$ Spent	Unavoidable Commitments	Total Committed	Cancel All	Complete 1, 2	Complete All
Design and Construction:						
- engineering	400	30	430	10	140	180
- permanent materials:						
. 0,1,2,	980	180	1,160	0	90	180
. 3,4	130	320	450	0	0	350
- total	1,110	500	1,610	0	90	530
construction	560	40	600	80	460	910
Total Design & Construction	2,070	570	2,640	90	690	1,620
Operations:						
- commissioning	20	0	20	0	150	170
- training	35	0	35	0	85	155
- heavy water	880	0	880	0	350	870
- fuel	0	0	0	0	30	70
Total Operations	935	0	935	0	615	1,265
Interest Charges	655	2,815	3,325	0	500	965
Total	3,660	3,385	7,045	90	1,805	3,850
Total Committed				7,045	7,045	7,045
Total Per Alternative				7,135	8,850	10,895

Notes:
1. Unit "0" refers to common services and facilities
2. "$ Spent" represents monies paid out to date
3. "Unavoidable Commitments" refers to monies which will have to be paid out to cover interest charges and to honour existing contract commitments, less $400 million in estimated savings (from contract costs avoided through negotiation and the salvage value of permanent materials)

SENSITIVITY ANALYSIS

Evaluating the economics of Darlington is a difficult task because the analysis depends on assumptions made about a wide variety of inter-related variables. Although the Committee has not been able to reconstruct Ontario Hydro's models, it has been able to explore the impact on the decision to continue with Darlington of changes in five variables: project costs, discount rates, decommissioning costs, export sales and coal prices. This type of analysis is often called a sensitivity analysis. This appendix reviews the results of the Committee's sensitivity analysis performed on the above variables, under the low growth scenario, and concludes that aside from load growth, changes in the discount rate and coal prices have the greatest impact on the decision to continue with Darlington.

(1) Project Costs

According to Hydro a significant portion (65%) of the total expected cost of Darlington has been spent or unavoidably committed (Exhibit E-1, opposite). Of the funds committed for materials and construction, but not yet spent, Hydro has estimated that 41% ($400 M of $970 M) is recoverable. A large variance of this assumption would have no significant effect on the decision.

The impact of unanticipated cost escalations on a project's economics can be dramatic, as the experience of many U.S. utilities has shown. However, the escalation of project costs is not a major factor in the case of Darlington for the following reasons:

(i) Unanticipated cost escalations are less likely to occur since the project is at such an advanced stage of completion;

(ii) Any escalations that do occur on the costs to be committed will have a proportionately smaller effect on the overall project's economics. It has been estimated that a 40% increase in the yet-to-be-completed component would raise the prsent value of the total lifetime costs of the project by less than 10%, or $800 million. Exhibit E-2 shows the impact on the costs of alternatives of increased project costs. Even at a 25% escalation in costs, completing Darlington is the lowest cost option;

(iii) Ontario Hydro has a good track record for controlling costs on the four nuclear stations prior to Darlington, as Charts 1 and 2 in Appendix F show. Current cost estimations place Darlington within the range of past projects on a cost/Kwh and manhours/Kwh basis;

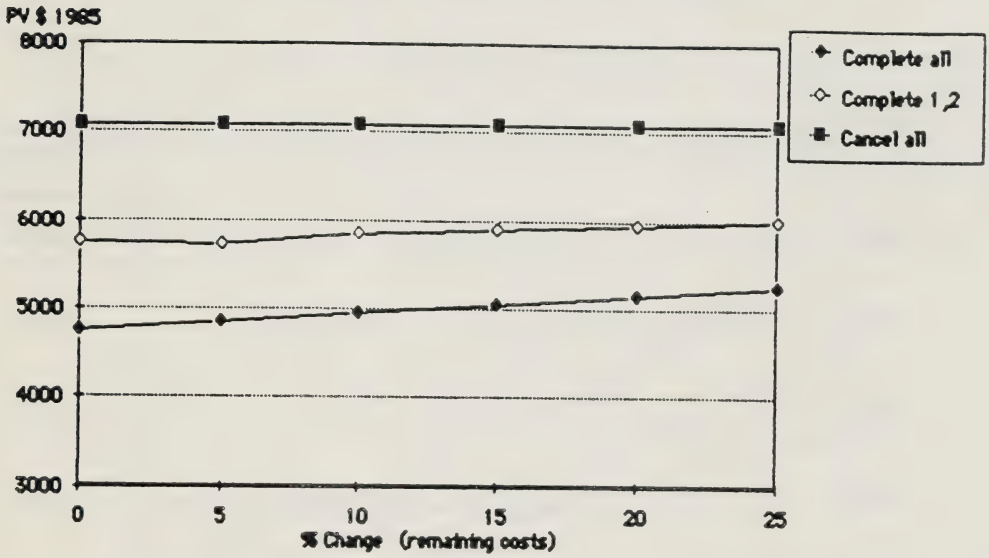
(iv) The cost increases that many U.S. nuclear projects have incurred are the result of factors unique to the U.S. situation and not transferrable to Ontario Hydro. These factors include:

(a) The Three Mile Island incident resulted in very stringent safety regulations being applied retroactively. Projects in progress were forced to backtrack and modify design and construction standards, and

(b) There is no standard reactor design. A proliferation of designs has not permitted many project management companies to gain the amount of experience that Ontario Hydro has compiled with the CANDU system.

EXHIBIT E-2

SENSITIVITY ANALYSIS - CAPITAL COSTS



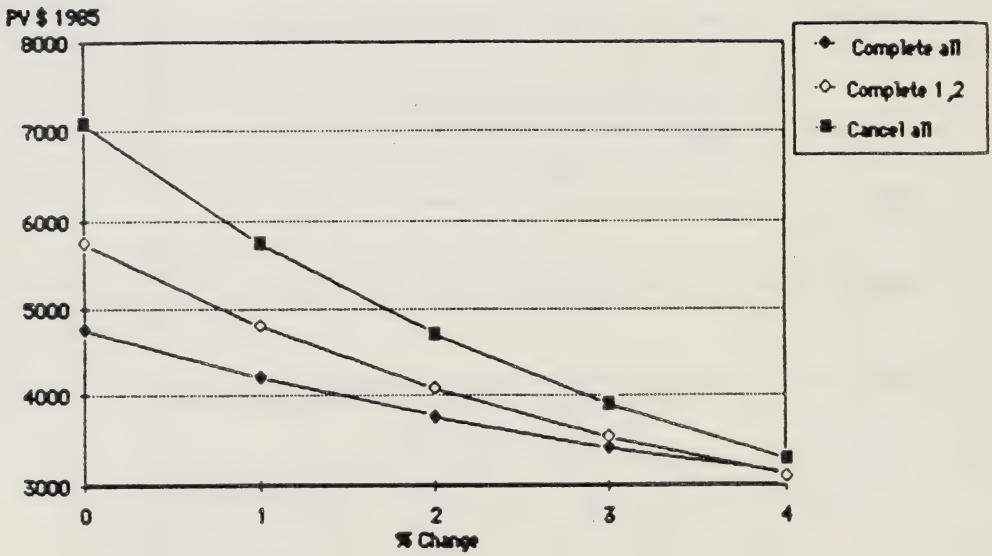
The charts and figures in Appendix F show that Ontario Hydro's performance on nuclear projects compares very favourably to projects in the United States.

(2) Discount Rate

The discount rate is an important factor in Net Present Value analysis. It is the rate at which future flows of money are discounted back to a common point in time for comparison purposes. It is determined by the organization's cost of capital, which in Hydro's case is basically its borrowing rate. Increases in the discount rate result in decreases in the value of future cash flows. In the case of Darlington, much of its cost advantage lies in fuel savings (uranium vs. coal) which are realized after the mid-90s as the units become fully operational. Therefore, if the discount rate was to increase then the alternative of completing Darlington begins to lose a key advantage. The discount rate could increase if Hydro's cost of capital were to increase. The Committee has found, as Exhibit E-3 (below) illustrates clearly, that the decision is very sensitive to changes in the discount rate.

EXHIBIT E-3

SENSITIVITY ANALYSIS - DISCOUNT RATE

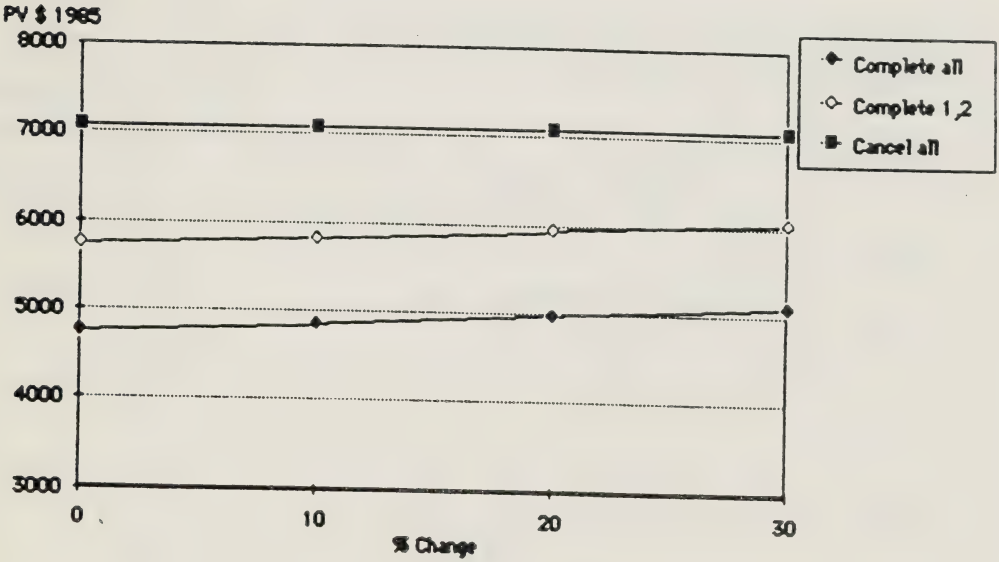


(3) Decommissioning Costs

Ontario Hydro puts funds away each year into a sinking fund to cover the costs of decommissioning. Hydro has incorporated into its analysis of alternatives a value for the sinking fund of 4% ($282 million) of the total 1985 in-service cost of Darlington. Witnesses have pointed out that there is no experience with decommissioning costs and they are very difficult to predict. These witnesses suggest that the costs could, in fact, be substantially higher, but the decision between alternatives is not sensitive to large increases in decommissioning costs (Exhibit E-4).

EXHIBIT E-4

SENSITIVITY ANALYSIS - DECOMMISSIONING COSTS

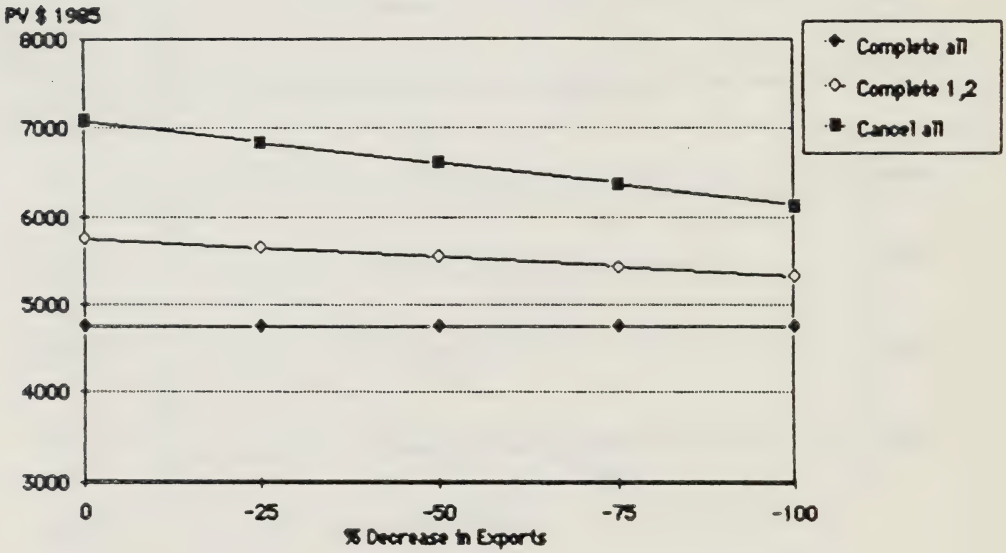


(4) Export Sales

In their presentation to the Committee, Ontario Hydro officials indicated that some surplus capacity would be available for export sales. The capacity available for export sales depends on the level of demand, so in each demand scenario the level of sales is different. Ontario Hydro adds an estimATe of lost revenue to the cancellation alternative, thus making them less attractive. The estimate of lost revenue reaches as high as $970 million (1985$), in the case of cancelling all four units in a low growth scenario. Exhibit E-5, below, shows that the decision does not depend on export sales alone. With no export sales, the alternative of completing Darlington is still the best option. It is more favourable than cancelling Units 3 & 4 by $563 million, and cancelling all units by $1,354 million.

EXHIBIT E-5

SENSITIVITY ANALYSIS - EXPORT SALES

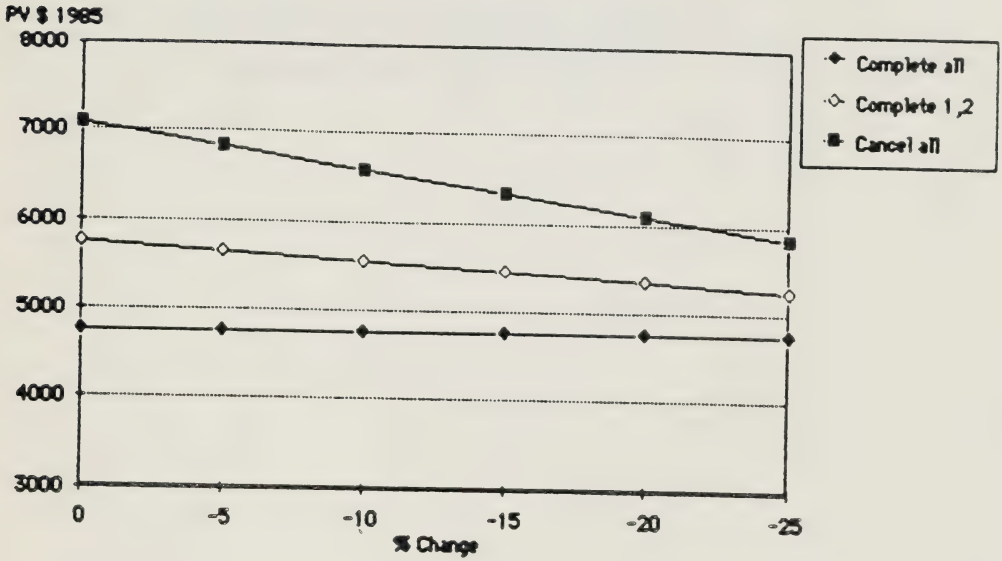


(5) Coal Costs

Although the capital costs of coal-fired plants (with acid gas emission controls) are 40% less than the capital costs of nuclear plants, Ontario Hydro estimates the fuel costs to be five times higher. Over the lifetime of a plant, total capital and operating costs of a coal-fired plant are about 40% higher than a comparable nuclear plant. It is apparent that the price of coal is an important variable in the decision between coal and nuclear and, as Exhibit E-6 shows, the total cost of each alternative is affected substantially by changes in coal costs. As in the case of the other variables, a wide variance in coal costs will not, by itself, change the choice of completing Darlington as the most favourable alternative.

EXHIBIT E-6

SENSITIVITY ANALYSIS - COAL COSTS



APPENDIX G

Information on Ontario Hydro's Record on Cost Control

TABLE 1

COST DATA FOR NUCLEAR PROJECTS (1984 $/kW)

	Pick A 2080 Mw	Pick B 2064 Mw	Bruce A 2960 Mw	Bruce B 3124 Mw	Darl. 3524 Mw
Total Engineering	139	215	154	182	171
Permanent Material	474	630	493	555	595
Construction	351	425	307	354	420
Interest	131	305	178	230	331
Design & Construction	1095	1575	1132	1321	1517

Notes: 1) Total engineering includes Hydro, consultant and administration costs
2) Construction includes Hydro and contract direct costs plus total indirect costs
3) Cost per kilowatt based on net station electrical output
4) Interest included at 4%

TABLE 2

PROJECT MANHOURS PER KILOWATT
NUCLEAR STATIONS

Manhours/kW

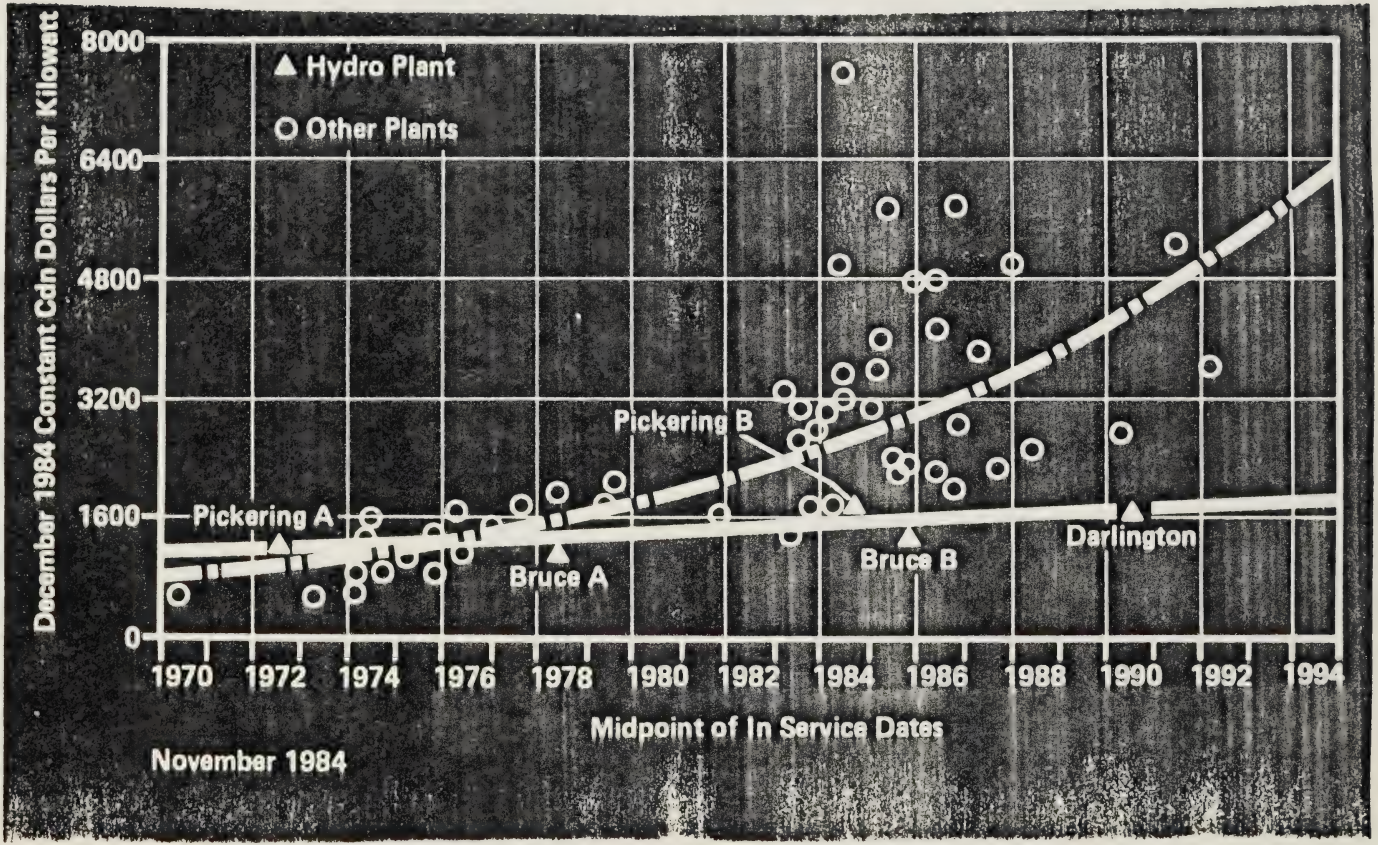
Station	Engineering	Construction	Commissioning	Total
Pickering "A"	2.5	10.9	1.1	14.5
Bruce "A"	2.7	9.8	1.0	13.5
Pickering "B"	3.8	14.5	1.3	19.6
Bruce "B"	3.3	11.2	1.0	15.5
Darlington	3.6	12.6	1.1	17.3

November 1984

Source: Ontario Hydro

TABLE 3

ELECTRIC UTILITY COST GROUP DATA NUCLEAR PLANTS
Graphic Comparison of Total Project Cost in Constant Cdn.$



Source: Ontario Hydro

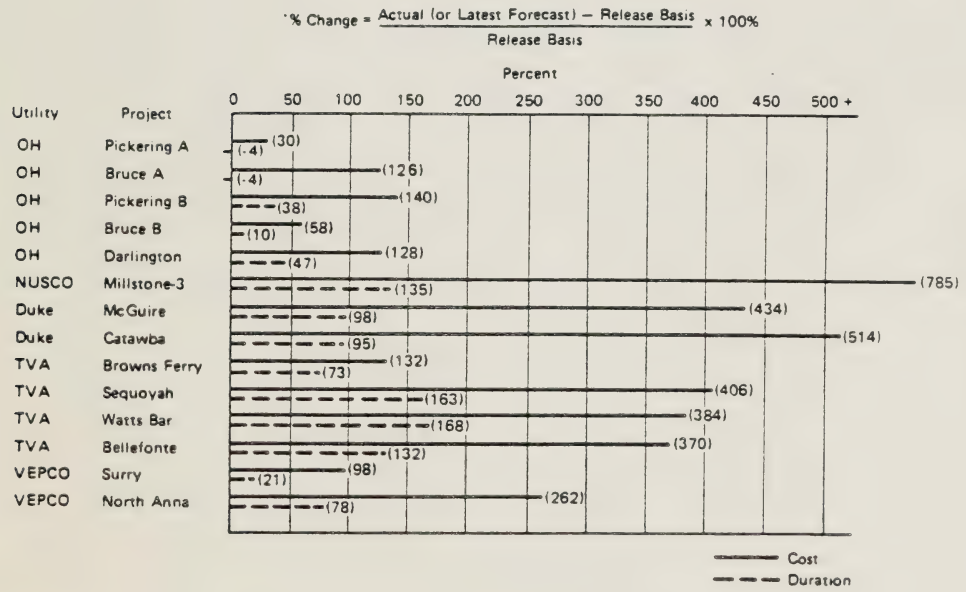
COMPARISON OF ONTARIO HYDRO'S COST CONTROL ON NUCLEAR PROJECTS WITH SELECTED U.S. PROJECTS

The chart below compares Ontario Hydro (OH) with the following U.S. utilities:

- Northeast Utilities Service Company (NUSCO)
- Duke Power Company (DUKE)
- Tennessee Valley Authority (TVA)
- Virginia Electric and Power Company (VEPCO)

These utilities were chosen for their relative similarity with Ontario Hydro; each has had significant nuclear experience and has also actively participated in the management of its own projects.

As the chart below shows, Ontario Hydro has generally experienced smaller variances in its project estimates between original authorization and final or latest projection.



Source: Ontario Hydro, Capital Budgeting and Cost Control: A Comparison of Ontario Hydro and Four Selected United States Utilities, a report to the Ontario Energy Board, April 1984

APPENDIX H

Ontario Hydro Forecast of Coal Prices for the Most Probable Load Growth Scenario

Delivered Prices of Coal - Forecast Load Growth
(Prices in $Cdn/MBtu)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 on
US Bituminous Coal													
Blended	2.40	2.60	2.82	3.08	3.30	3.55							
Incr. High Sulphur							2.91	3.05	3.20	3.35	3.50	3.65	at U.S. inflation
Western Canadian Coal													
Blended (to E. System)	3.82	4.11	4.37	4.67	5.02	5.42	5.65	6.08					

Fuels Division

September 26, 1985

September 26, 1985

NOTES:

1. All coal prices are based on the "most-likely" economic assumptions forecast by Economics Division and forecast conditions in the marketplace for coal. In general, coal prices are expected to decline in real terms relative to Canadian inflation throughout the remainder of the decade. Prices are then expected to recover somewhat and will increase at approximately the rate of inflation thereafter.

2. Blended coal prices for U.S. and Western Canadian coals correspond to forecast prices for contract commitments, including all sulphur levels, to the year 1990.

3. Incremental prices for higher sulphur U.S. coal (2.5%S) are given after 1990 when many of the current U.S. contracts have expired and new supplies are required. Requirements for incremental medium (1.5-2.0%S) and lower sulphur (< 1%S) coal are currently forecast to be at a premium of 15-20% and 25% respectively above the higher sulphur coal prices.

4. After 1992 there is no identifiable split between U.S. and Western Canadian supplies. Coals of various sulphur levels are blended to give the appropriate sulphur levels above.

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